HUMAN AND WILDLIFE COEXISTENCE IN THE MARINE ENVIRONMENT:

A CASE STUDY IN THE MORAY FIRTH

By

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Abstract

The management of a marine protected area, concerning a resource that is generally exploited for different interests, needs the support of the involved communities to be effective and long-lasting. The Moray Firth is an area of recognised biological importance, which economy heavily relies on the marine environment. To date, no studies concerning public perceptions of wildlife and conservation were carried out in the area. The aim of the present study was to apply social science techniques to investigate this point and the complex integration of human activities and environmental processes. Local inhabitants, visitors and major stakeholders were interviewed during July and August 2006. Results indicated a considerable degree of support and awareness of the local wildlife. Many activities that take place in the area were perceived as a threat for the cetacean species that occur in the waters of the firth. The importance of further research, monitoring and enforcement to preserve the biodiversity of the Moray Firth was underlined. However, critical issues concerning the establishment of a marine protected area and its impact on local economic activities were stated.

Acknowledgments

“Conservation is about people as much as is about species or ecosystems”
Mascia et al. 2003

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1 Introduction

Scotland environmental resources include over 90,000 species and several areas of conservation with internationally-recognised value (Scottish Executive, 2005). The Moray Firth, in north-east Scotland, containing 34 Sites of Special Scientific Interest, one National Nature Reserve, one National Scenic Area and a Special Area of Conservation that interests the Inner Firth (Eleftheriou *et al.*, 2004), is certainly one of these key areas for conservation (Figure 1.1).

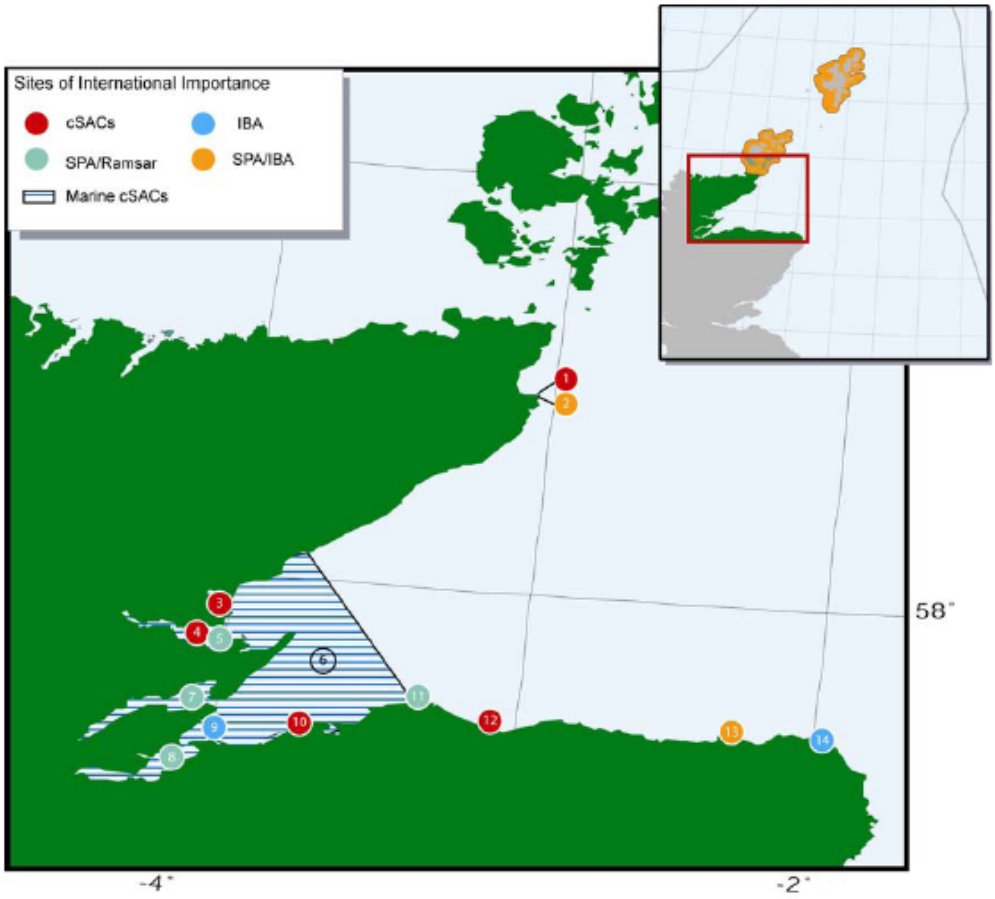

Figure 1.1: Coastal sites of international importance in the Moray Firth region (From DTI, 2004a).

Three species present in Annex II of the EC Habitats Directive (92/43/EEC), are actively protected in the Moray Firth in view of a recognised need for their conservation on a European level. The Moray Firth Special Area of Conservation was established in 2005 to protect the only resident population of bottlenose dolphin

(*Tursiops truncatus* Montagu 1821) in the North Sea. In addition, the Dornoch Firth was designated in 2000 as a candidate SAC for the common seal (*Phoca vitulina* Linnaeus 1758). Furthermore, several rivers flowing into this north-east embayment, including the Oykel, Cassley, Spey, Moriston, Berriedale and Langwell, were designated for the protection of the Atlantic salmon (*Salmo salar* Linnaeus 1758).

The Moray Firth is a complex environment in which the inherent needs of economic industry must be balanced with those required for conservation. The relationship between exploitation and conservation of the marine environment has two main components. On the one side, economic development may be seen to threaten the environment and some human activities that take place in the Moray Firth, such as fishing, oil and gas extraction and shipping for example, have a recognised impact on cetaceans (Parsons *et al.*, 2000; Scottish Office, 1996; Harding-Hill, 1993). If not sensitively managed these activities might lead to a loss in biodiversity, a consequence with clear impacts on fishing and wildlife tourism, and this leads us to the second component, the dependence of economic development in this area on the ultimate conservation of those species.

As Buttler (2005) suggests, the Moray Firth represents a case study of the conflicts that can occur between economic and conservation interests. In his evaluation of the Moray Firth Seal Management Plan (Buttler, 2005), he outlines three examples that illustrate the situation. Firstly, salmon are one of the protected species in this area, which generates a significant income since the local yield represents approximately 30% of Scotland's total salmon catch. Secondly, the area also offers protection to seals as well, but the seals are perceived as a threat by local fishermen in view of their direct predation of the salmon itself. Lastly, seals together with dolphins and other species of megafauna (e.g. basking sharks, turtles, sunfish etc) and marine birds are undoubtedly important to the growing local tourism industry, generating £3 million per annum (Buttler, 2005).

The importance of such “marine resources” to the Moray Firth area must be considered not only in terms of their scientific and environmental value, but also with respect to their economic exploitation. Thus, when establishing a conservation programme the recognition of this multiple perspective is critical. Because of the inter-connected nature of the different activities that take place in the marine environment (Kelleher, 1999) a focused effort must subsequently be made to find an agreeable balance between species preservation and the needs and desires of the general public.

Engaging the public in conservation activities and acquiring accurate information on the key issues and concerns of the public are considered essential criteria for the development of any conservation program. Public perception is determinant for two reasons. Firstly, most actions towards environmental protection often begin with an individual decision to safeguard something of perceived value (Primack, 2000). Secondly, environmental defence is more likely to meet its objectives if it is be perceived by the public to enhance the value of the area rather than negatively affect its traditional practices.

Conservation, according to the words of Fernández and Castilla (2005), is defined as the branch of knowledge where natural and social science are combined to achieve preservation and sustainable use of ecosystems. Nowadays, the social component of conservation is globally accepted and stakeholder involvement in environmental management and policy-making is a recognised step towards long-lasting environmental protection. Due to many complex activities that depend on the marine environment, however, there is undoubtedly further need for public support for conservation (Kelleher, 1999).

After the 1997 IUCN’s World Commission on Protected Areas (WCPA), many programs and tools were generated to evaluate the effectiveness of marine protected areas. This assessment was internationally significant as the conservation of natural resources has become an issue of global concern and standardised analysis to

prioritise current interventions are needed (Hockings *et al.*, 2000). Whilst biological conditions of the area of interest were the primary component of the aforementioned evaluation, the degree of management community support has become progressively more important.

Investigating present concerns and support for environmental issues can be uses as a basis for future involvement and education for the public. Environmental education can be a powerful tool for shifting people's attitudes towards nature (Hunter, 2002), and building a community's understanding of the local environment can further increase an individual sense of responsiveness towards it. In this respect, the use of questionnaires to investigate public perceptions of environmental management is increasing (White *et al.*, 2005). For example, Bunce *et al.* (2000) highlight how information obtained through public opinion surveys can be used to bolster plans for managing the environment, reducing negative impacts on the community and strengthening the positive effects. Past experience has further demonstrated how local community involvement is required not only for building public support, but also for increasing local knowledge and skills in managing an area (Himes, 2003).

Studies investigating specific concerns about the marine environment in Scotland were carried out along in the west coast by Scott and Parsons (2001, 2004, & 2005) and by Howard and Parsons (2006). Much of this research, commissioned by Scottish Natural Heritage, was focused in the Argyll region to investigate the level of marine environmental awareness and concern. Additional studies by Howard and Parsons (2006) later looked at the relationship between threats identified by conservationists and the perception of the general public of these issues.

Data obtained through public opinion surveys can represent the starting point for the improvement of conservation practices. It represents a basis that could be used to:

- Evaluate present management satisfaction and support

- Take into account local knowledge in the development of new programs
- Estimate future cooperation and support offered by the local community for environmental issues
- Create a baseline against which compare public environmental awareness after the complementation of respective conservation programmes
- Draw the attention to the need for further environmental education and public awareness initiatives.
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To date, no studies concerning the awareness and concerns of major stakeholders about marine wildlife have been conducted in the Moray Firth. The aim of the present study is to apply social science techniques to investigate this point and the complex integration of human activities and environmental processes in this area.

1.1 Aims and objectives

This study will investigate the degree of awareness and concern about cetaceans in the Moray Firth. In this respect the objectives of this project are to:

i. investigate the level of awareness of the local community and seasonal inhabitants of the Moray Firth about the cetacean species present in the area.
ii. determine which human activities that take place in the area are perceived by the local community and seasonal inhabitants to be threats to the marine wildlife here.
iii. evaluate the level of support for marine conservation at the local and national level expressed by the local community and seasonal inhabitants.
iv. evaluate and compare the opinions of important stakeholders of the area about marine wildlife conservation.

v. combine the gathered information in order to evaluate from a social perspective the possibility of establishing a marine protected area (MPA) for the Moray Firth embayment as a whole.

1.2 Structure of the work

The following study is divided in six chapters: Chapter 1, presents an overview of the subject; Chapter 2, offers a literature review of the different issues related to conservation in the marine environment and a description of the study area, both from the natural and social perspectives; Chapter 3, describes and justifies the methods used in the present study for the generation of data; Chapter 4, presents the results of this study; Chapter 5, the gathered data are analysed considering together the results obtained with the different methods utilised; and finally Chapter 6, presents the conclusions made and recommendations inferred.

2 Literature review

2.1 Marine conservation and environmental threats

On a global level, humans rely on marine resources for a wide range of activities, for recreational, aesthetic and economic reasons (Himes, 2003). Just in recent times people started to become aware that the oceans do not contain an endless source, that they can not eternally dilute pollution or absorb the impact of shore development (Granek *et al.*, 2005). The effects of these environments, once perceived as simultaneously depletable and renewable (Ostrom *et al.*, 1999) are manifesting themselves, and the loss of species and environments is maybe the most evident result. Ruckelshaus and Hays (1998) point that the primary sources of biodiversity decline in the marine environment are: overfishing, pollution, habitat destruction and fragmentation, introduction of nonindigenous species and climate change. To understand the aims of marine environment conservation, these major threats are analysed in this section.

Fishing

The perception of the marine environment as a never-ending exploitable resource has been defeated, when the utilization of marine organisms went beyond the limit after which a population could not recover. Fishing in an unsustainable way, which does not allow the natural recover of fish populations, is generally called overfishing. It has not only a direct effect on the targeted species, but generates several indirect outputs that are equally dangerous. Some of these threats are generated by the fishing method, as bycatch, habitat destruction and alteration of predator-prey dynamics (Ruckelshaus & Hays, 1998). On a global scale, entanglement in gillnets and other types of passive gear used both by artisal and pelagic fisheries is the main cause of mortality for dolphins, whales and seals from 1960 (Crespo &

Hall, 2001). Trawl and scallop dredging fisheries car heavily damage the sea bed if a recover time is not allowed (Parsons *et al.*, 2000).

Pollution

The impact of pollutants on marine wildlife is broadly recognised (Ruckelshaus & Hays, 1998; Tuerk *et al.*, 2005). Organochlorine compounds used in agriculture can reach coastal and estuarine areas (Crespo & Hall, 2001). These substances and heavy metals from industries can be transferred to marine mammals mainly through their diet (Bjørge, 2001). These substances tend to be accumulated in the fat tissues and concentrated across trophic levels, with an increased poisonous effect from preys to top predators. Marine traffic is not only a major cause of pollution but it generates disturbance and noise which may impact cetacean populations (Notarbartolo di Sciara, 2003). Seismic oil exploration is another source of noise pollution. The UK government issued a code of practice to prevent lethal effect of this latter impact upon cetaceans, but it still remains an issue (Parsons *et al.*, 2000).

Habitat destruction and fragmentation

The majority of marine mammals spend at least part of their lives in coastal areas (Crespo & Hall, 2001), being affected by humans coastal development. The destruction of marine habitats can be the result of dredging and commercial trawling for fish (Ruckelshaus & Hays, 1998). Habitat degradation may be defined as “a shift in the characteristics of an area from favourable factors to increased disadvantageous factors” (Bjørge, 2001). On a global scale, habitat degradation is the major proximate cause of biodiversity loss (Stedman-Edwards, 2001). The consequence of local destructions is the fragmentation of the remaining environment (Ruckelshaus & Hays, 1998), with a consequent reduction of available resources. If this reduction reaches a critical threshold, the living biota is unlikely to be retained (Lambeck, 1997).

Introduced species

Examples of human mediated introduction of non-indigenous species are the transport of communities on the bottom of ships, the movement or intentional release linked to aquaculture, fishery and management practices, the connection of different communities through canals and liberation of organisms in ballast materials of ships (Ruiz *et al.*, 1997). Human introduction of species, both on purpose and accidentally can lead to the homogenization of distinct biota with the alteration of the natural communities (Ruckelshaus & Hays, 1998). The invasion of non-indigenous species and the consequent change in the marine community represents a considerable stressor (Ruiz *et al.*, 1999).

Climate change

The increase in temperature observed in the last century, widely correlated with human generated emissions of carbon dioxide and greenhouse gases, is perceived as possible threat for marine wildlife. Genner *et al.* (2004) correlated climate induced changes in sea-surface temperatures with observed changes in fish species composition. These alterations in fish communities can particularly threaten land-breeding pinnipeds, since they do not travel long distances during the breeding season (Würsig *et al.*, 2001).

The impact of climate change on cetaceans is not only a possible future outcome, but it has already been observed. Focusing on strandings and sightings of these marine mammals, MacLeod *et al.* (2005) registered a decline in numbers of cold water species and an increase of warm water species in North-West Scotland. What they concluded from their study and from previous literature is that the modification of cetacean communities can have serious consequences on their conservation, moving them from areas specifically designated for their protection, reducing the range of colder water species and

affect the survival of the species through the alteration of their community structure (MacLeod *et al.*, 2005).

2.2 Conservation biology and the social science

The factors described in the previous section were also identified as major causes of biodiversity loss by Stedman-Edwards (2000) in her framework for the analysis of the socioeconomic roots that cause this loss. The objective of this framework was the connection of these proximate causes to their root causes.

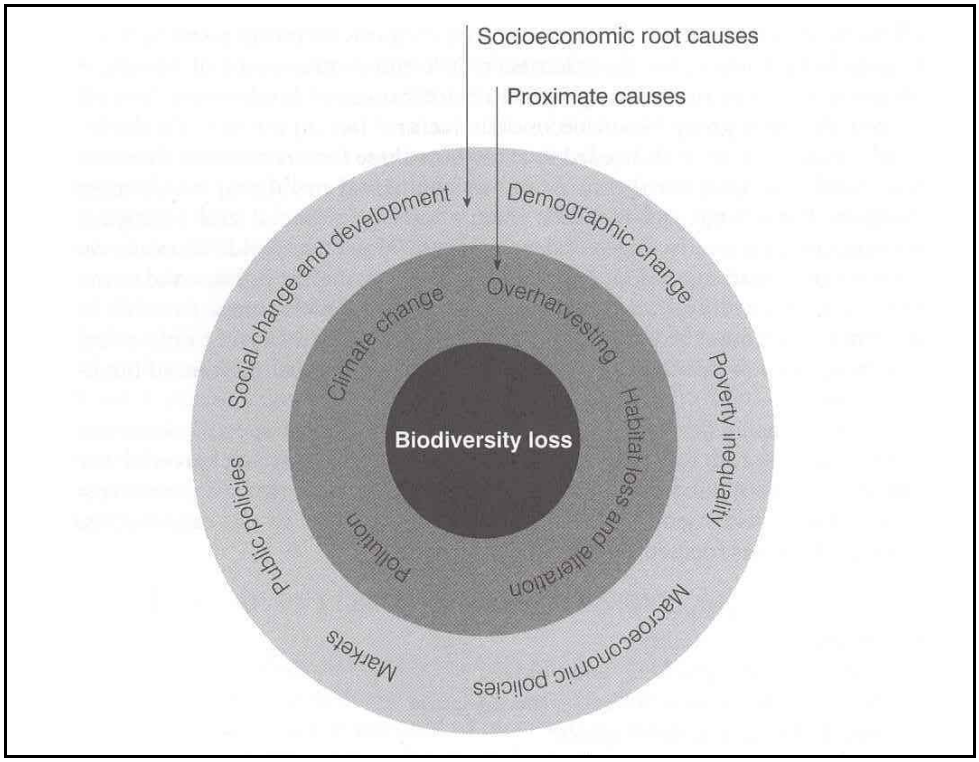

Figure 2.1: Biodiversity loss, proximate and socioeconomic root causes. (From Stedman-Edwards, 2000).

As it is illustrated in Figure 2.1, socioeconomic factors are identified as the driving force that encourages activities that put pressure on biodiversity and generates disincentives for more sustainable actions (Stedman-Edwards, 2000). Whereas the objective of this section is not the analysis of these factors, this framework is here used to highlight the importance of social science for biodiversity conservation.

Conservation biology as a science aims to maintain the planet biological diversity. What is nowadays becoming clear is that its application is related to a broader set of social disciplines (Hunter, 2002). Scientific research can offer determinant knowledge about the state of the environment and suggest which actions and behaviours should be preferred or modified in order to preserve this planet, but its actual protection would only be ensured by the convergence of a broader set of aspects. Scientific experience and contribution should act in a new "broader social, economic and institutional context that allows the involvement of different stakeholders" (Leslie, 2005). As it is represented in Figure 2.2, a long lasting preservation of biodiversity can be reached when environmental protection is matched by policy making, education and behaviour changes. The recognition that conservation policies are inherently linked to changes in human behaviour is a determinant step towards success (Mascia *et al.*, 2003).

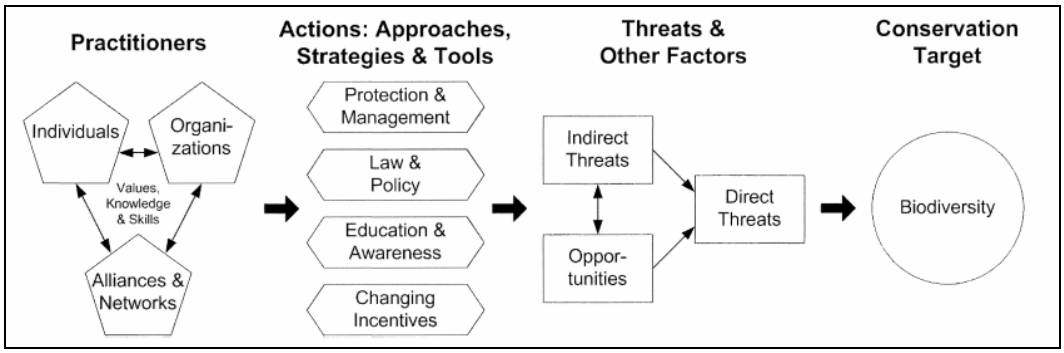

Figure 2.2: A generalized model of a conservation project (Salafski *et al.*, 2002).

Wallace (2003) agrees on the importance of education, underlining that it constitutes the first step for the achievement of effective decision-making and management. Eventually, the triumph depends on wide public support (Miller & Hobbs, 2002).

Conservation biology requires the combination of natural ecosystems and human societies, in a complex and experimental, sometimes uncertain way (Salafsky *et al.*, 2002), and a real integration can only take place with mutual respect of the involved values. Nature preservation should not take the form of an imposed instance

of a higher authority. Jones and Burgess (2005) suggest that objectives that follow top-down approaches may never be reached owing to users' apathy and non-cooperation. Top-down management may generate frustration and alienation in the public that has to accept a new administration of the resources that represent their income.

What's more, social aspects not only are the ground for effective changes and support, but they can voice the public perspective. The contribution of local communities experience and understanding to marine management strategies can be extremely valuable (Sloan, 2002). So its use is not only ethic, as it would allow the consideration of locals needs, but is precious per se. Marine and fisheries biologists are aware of the need for a "more comprehensive, scientifically informed, and better-integrated approaches to conservation" (Meine *et al.*, 2000) and the inclusion of the traditional local knowledge can be a step towards it.

2.3 Marine Protected Areas

As a result of the concern about the preservation of marine species and habitats, massive effort has been devoted to the definition of the correct design of those areas assigned to the conservation of this environment. According to the IUCN (1994) definition, a Marine Protected Area (MPA) is "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment". In general, the term Marine Protected Area is used to refer to areas set aside by law or other means, to preserve part of the entire enclosed environment (Gubbay, 2005). These areas are effective tools for the achievement of the three core objectives of living resources conservation (IUCN, 1980):

- The maintenance of ecological process and systems
- The preservation of genetic diversity

- The sustainable use of species and ecosystems

Conservation and sustainable human use are two central points that motivate the establishment of MPAs (Roberts *et al.*, 2003). After years of conflict between marine resource management and involved stakeholders, the need to incorporate cultural and socioeconomic into all the aspect regarding Marine Protected Areas, from their design and implementation to daily decisions, became a fundamental component (Himes, 2003). What today is generally recognised is that affected people should be involved in MPAs, from the first stages of goals identification. This participation of different stakeholders is sought in the collaborative management (Jones & Burgess, 2005).

The Marine Reserves Working Group (MRWG) that developed the California Channel Islands Marine Reserve constitutes a successful example of this approach. The MRWG was composed by federal and state agencies, commercial and recreational fishermen, environmentalists and members of the Santa Barbara Community. These various actors stated the goals together, which ranged from conservation and sustainable fisheries to recreational uses, awareness and enjoyment of marine resources (Araimé *et al.*, 2003).

Since the establishment of a MPA is going to have an inevitable effect on those who use the interested marine resource for their livelihoods, the challenge is to channel the local community reaction into support (Wells & White, 1995).

2.4 Cetaceans and conservation

Many of the focal species, towards which MPAs are implemented, are part of the charismatic megafauna (Roff & Evans, 2002). Large ocean species of marine mammals and birds are used as a focus for conservation efforts. What is often criticised of this approach is that is driven by public affection rather than by an ecological basis (Hooker & Gerber, 2004).

The order *Cetacea*, which includes whales, dolphins and porpoises, are part of the marine mammals targeted in marine conservation. Eric Hoyt (2005) recognises four reasons, a part from their intrinsic value, why they can effectively help the design and management of a marine protected area:

- Cetaceans can lead public education and create a constructive community identity.
- Cetacean conservation done properly is an example of ecosystem conservation. Even if established around a single species, protecting these animals in their wide range can potentially protect all the organisms and habitats included in that area.
- Presence and absence of cetaceans can be used to monitor the marine environment health. Marine predators may provide a useful indication and protection of productive areas (Hooker & Gerber, 2004).
- The popularity of cetaceans can represent a driving force extending the managed area and increasing available funding.

2.5 Background: the study area.

The Moray Firth is the largest Firth in Scotland, with an area of approximately 5,230 km^2 (Tilbrook, 1986). The embayment is included between Aberdeenshire, Banffshire, Moray and Nairnshire on one side and Ross and Cromarty, Sutherland and Caithness on the other. Stretching from Duncansby Head in the north, to Fraserburgh in the east and to Inverness in the west, it has a coastline of more than 800 kilometres and it contains three smaller firths, the Dornoch, Cromarty and Inverness Firths (Harding-Hill, 1993).

The firth is effectively part of the North Sea, showing continuity of large-scale environmental aspects like water circulation and climate patterns (Eleftheriou *et al.*, 2004). It is generally divided in Inner and Outer Moray Firth. The border between the two goes from Helmsdale, on the north coast, to the River Spey on the south, and the area of the Inner Firth roughly coincides with the boundaries of the established Special Area of Conservation for the bottlenose dolphin (*Tursiops truncatus*).

There are many towns and cities of moderate size along the costs, which originated as fishing ports, such as Buckie, Lossiemouth, Macduff and Fraserburgh, whereas the largest and fast-growing city is Inverness in the mouth of the Firth (DTI, 2004a).

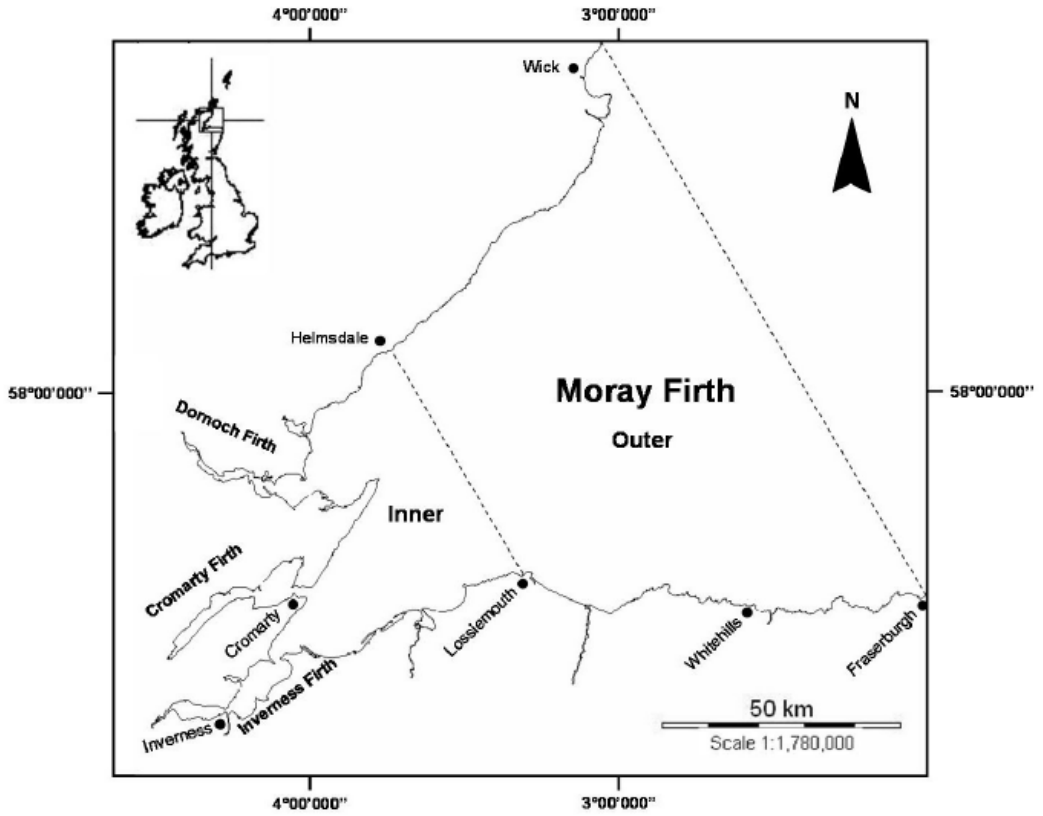

Figure 2.3: Map of north-east Scotland showing the location of the Moray Firth. The dashed lines show the divisions between the inner and outer Moray Firth respectively. Adapted and redrawn from JNCC (1999).

2.5.1 Economy

The Moray Firth is economically important for several activities, such as oil extraction, industrial waste discharge, military training, commercial fishing, transportation and recreation (Hardin-Hill, 1993).

The several ports present in the area are used for both international trade and local recreational craft. The Moray Firth provided in the past a significant proportion

of the inshore fishing in the North Sea, but during the last 20 years a significant decline in the fishing stocks was registered (Wright *et al.*, 1998).

The area is important for a wide range of different fisheries. The weight of pelagic and demersal fisheries dropt in recent years and many vessels are now used for shellfish (MFP, 1998). Besides the decrease of the workforce in 2004, the 429 vessels of the three districts of the Moray Firth (Fraserburgh, Buckie and Wick) generated a sale value of approximately £60 million employing 1,232 fishermen (Southall, 2005).

Plate 2.1: Trawler in the harbour of Fraserburgh.

The north-east of Scotland is also very important for the offshore oil and gas industry. The Beatrice oilfield was discovered in 1976 and oil was extracted since 1981 (DTI, 2004b). According to the Scottish Coastal Forum (SCF, 2004) there is the potential for further development of the oil industry in the area. A study was undertaken to investigate the feasibility of the construction of an offshore wind farm close to the Beatrice oilfield.

The inner and outer Moray Firth, are used by the Air Force for several activities, as radar training, high and low-angle gunnery and air to sea or ground firing (DTI, 2004b).

Agriculture remains a significant component of the local economy, whilst the natural environment is now a recognised attraction of the growing tourist industry (MFP, 2006).

A component of the tourist sector is whalewatching, which is defined according to the words of the IWC (1994) as “any commercial enterprise which provides for the public to see cetaceans in their natural habitat”. It is regulated in the Moray Firth by a voluntary code, the Dolphin Space Programme (DSP). The code was created to reduce wildlife disturbance from whalewatching boats and to develop educational experiences associated to this activity (Arnold, 1997).

2.5.2 Biodiversity

The Firth represents an area of recognised biological importance, which is under threat from the economic activities that take place in the area (Wright *et al.*, 1998). As a result of these impacts and in order to protect the last resident population of bottlenose dolphins remaining in the North Sea (Wilson *et al.*, 1999), the inner part of the Moray Firth was designated as a candidate Special Area of Conservation in 1996 and became a SAC in 2005. This status, being part of the Natura 2000 network of protected areas, led to the development of a management scheme which aims are the maintaining of the dolphin population and the promotion of sustainable development respecting the economic, social and scientific needs of those who live in the area (MFP, 2003).

The bottlenose dolphin is not the only cetacean that occurs in the waters of the firth: Minke whales (Balaenoptera acutorostrata) and harbour porpoises (Phocoena phocoena) regularly occur, and killer whales (Orcinus orca), Humpback whales (Megaptera novaeangliae), pilot whales (Globicephala melas) and Risso’s dolphins (Grampus griseus) were recorded in the Outer Firth by Robinson et al. (2005).

Plate 2.2: Gannet (*Sula bassana*). The biggest European colony of this marine bird is located in Troup Head, Aberdeenshire.

Plate 2.3: Bottlenose dolphins (*Tursiops truncatus*). To protect this species, a SAC that encompasses the Inner Moray Firth was designated in 2005. Photo credit Kevin Robinson/CRRU.

Plate 2.4: Minke whale (*Balaenoptera acutorostrata*). This species is present in the IUCN Red List of Threatened Species as LR/nt, Lower Risk near threatened. Photo credit Nina Baumgartner/CRRU.

2.5.3 Moray Firth Partnership

An important component of the area is the Moray Firth Partnership, a voluntary coalition, with over 600 members (MFP, 2006) which mission is the promotion of sustainable development and the integrated management of natural, cultural and economic resources, to enhance life quality for all the residents (MFP, 1999). It was established in 1996, when the UK Biodiversity Action Plan highlighted the need for integrated management in the Moray Firth (MFP, 2006) and its main objective is the improvement and facilitation of communication amongst industry, local authority, conservation bodies, recreational users and local residents (DTI, 2004b).

3 Methodology

The aim of the present study is the investigation of public attitude to marine wildlife conservation in the Moray Firth. The methodology was designed to investigate the following points:

- The degree of awareness within the local community with respect to the cetacean species present in the area.
- The degree awareness amongst visitors and tourists with respect to the cetacean species present in the area.
- Is the general public concerned for the wellbeing of the marine wildlife?
- Does the public support a possible future Marine Protected Area in the Moray Firth?
- The state of marine conservation in the Moray Firth according to important stakeholders

3.1 Stakeholders survey

3.1.1 Respondents selection

The marine environment of the Moray Firth has different values for the different stakeholders. The sea enclosed in the Firth has a major importance for scientific research, because it contains the only resident population of bottlenose dolphins (*Tursiops truncatus*) in the North Sea and several other species, and therefore is a key area for wildlife conservation. In addition it provides the income for the local community, trough fishing, and is used for leisure and tourism (E.g., whale and dolphin watching activities).

The different values, symbolized in Figure 3.1, were used to identify the relevant stakeholders, in order to include representatives of the different identified sectors in the survey.

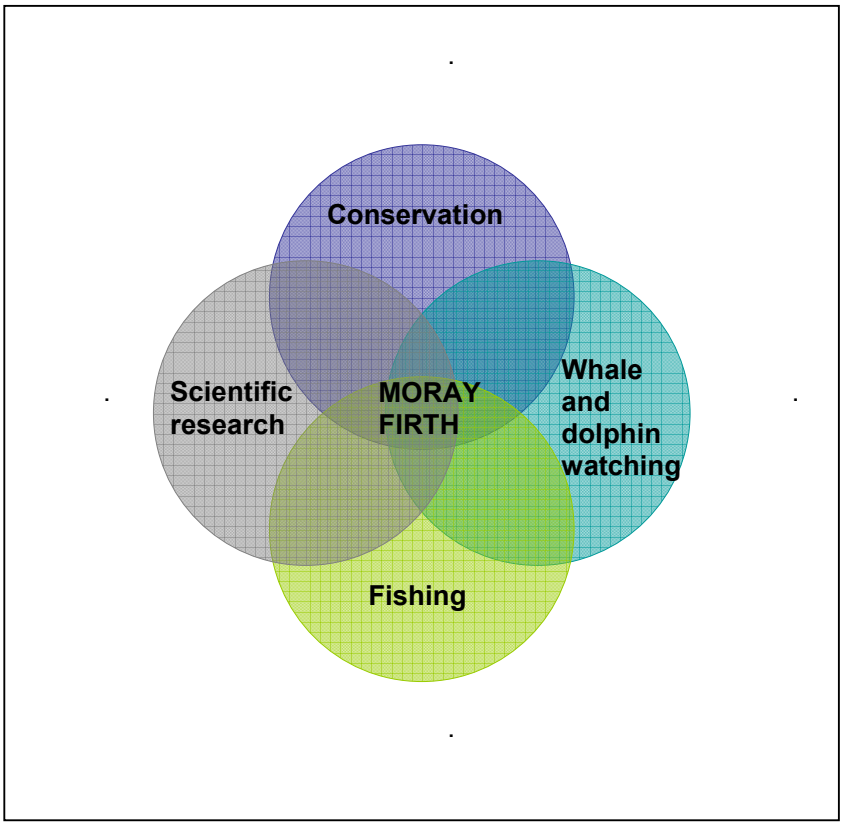

Figure 3.1: The different values of the marine wildlife of the Moray Firth.

Since the purpose of this study was to interview decision-makers and protagonists, an illustrative sample of people related to conservation, scientific research, fishing and whale and dolphin watching in the area was created (Wallace, 2003). An in depth interview was carried out with every representative.

3.1.2 Semi-structures interviews

A semi-structured interview in person or by telephone was carried out with every representative of the selected sectors. The main characteristic of this method is the adoption of a flexible interview schedule (Bryman, 2004). This approach was chosen in order to be able to adapt the questions to the different interviewees, and to investigate their personal opinions, what would not have been possible with a more fixed format (Kitchin & Tate, 2000).

Before the interview, a set of questions were created to encompass knowledge of cetaceans, threats for the animals in the area, support of conservation in the area and specific topics related to the respondent position.

Every interview was preceded by a brief introduction of the project and followed by the dialogue transcription. When the interview was conducted face-to-face, and not by phone, and the interviewee agreed, a tape recorder was used. When this was not possible, notes were taken during the discussion and afterwards word-processed.

3.2 Public survey

To gain information about the general public an approach more quantitative was selected.

According to Bryman (2004) the first step of a quantitative research design is the development of the concepts that are going to be studied and this stage is followed by the identification of the research sites and the specification of the respondents (Figure 3.2). This framework was applied in the present research.

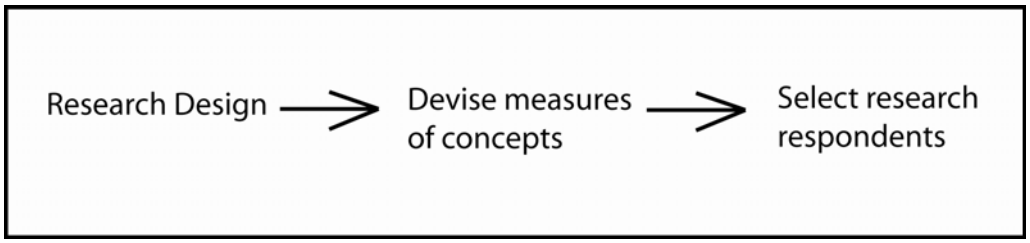

Figure 3.2: The process of quantitative research (Adapted from Bryman, 2004).

3.2.1 Concepts, indicators and questions

The aim of the study was the investigation of pubic awareness and concern about marine mammal species and conservation. Awareness, perception and concern are abstract concepts and therefore can not be directly measured on a scale. To analyse these concepts in a quantitative way, they were first translated into indicators (Bryman, 2004). For each concept a different number of indicators were identified:

- Awareness of the species present in the area.
  - Quantify the total number of cetaceans present in the area
  - Affirm if specified species are present or absent in the area
- Perception of the threats that the species face in the area and in the country
  - Perception of how seriously a set of given activities that take place in the area threat cetaceans.
  - Rate the protection of cetacean species in the country
- Conservation support on a general and local level
  - Rate the importance of conservation of wildlife
  - Opinion on a hypothetical local marine protected area
- Awareness of the level of protection afforded to cetaceans in the area
  - Protection status of species in the area
  - Knowledge of local marine protected areas
- Perceived economic importance of wildlife
  - Rate the economic importance of different activities for the area
- Perception of conflicts between the different activities that take place in the area
  - Identification of possible conflicts

The questions were developed taking into account the previous public opinion survey carried out in the west coast of Scotland (Scott & Parsons, 2001; Scott & Parsons, 2005). Some of the questions used in the questionnaire created by Scott & Parsons (2001) were adapted to the present context. The use of a previous study was considered an important component of the methodology because being consistent with it will allow a final comparison of the results obtained in the east and west coasts of Scotland.

3.2.2 Pilot study

This stage of the research was used to validate the approach and to verify if the questions wording and content were correct for the purpose of the study (Kitchin & Tate, 2000).

The questionnaire was initially designed as a self-completion questionnaire to be administrated via mail. This method would have allowed an increased of the

randomisation of the sample, but the pilot stage revealed its inadequacy in the present context. The detected defect was a significant rate of non-response because some of the respondents refused to answer to a self-completion questionnaire about conservation. The possible explanation is that the themes investigated in the questionnaire are trickier for those respondents whose economic activity is perceived to be in conflict with wildlife conservation. When the aim of the study was explained in person, the respondents were more willing to participate. For this reason and because a further rate of non-response due to illiteracy could not be excluded, a structured interview was considered the best option.

3.2.3 Structured interview

A structured interview involves the use of a fixed set of questions asked in a constant way and order (Sommer & Sommer, 1991). This standardisation of the process ensures a minimization of the differences between interviews and therefore allows the aggregation of interviewees' responses (Bryman, 2004). To ensure that order and wording of the questions were respected the schedule in Appendix I was used by the interviewer.

A further advantage this method offered was the possibility of probing the respondents to elaborate their answers.

Both closed and open-ended questions were used. With the first type, the interviewees had to choose from a set of given answers whereas in the second they were not constrained to categories fixed by the interviewer (Kitchin & Tate, 2000). This two approaches were used in a complementary way, since the former is more suitable of quantitative analysis and the latter should offer a better reflection of the respondent own thinking (Kitchin & Tate, 2000)

3.2.4 Sample

In the present study a non-probability sampling methodology was adopted. Even if this approach is generally used when there is not enough time or resources to create a statistically representative sample, since it doesn't require the predefinition of the involved stakeholders, it can give a better representation of the group diversity (Bunce *et al.*, 2000).

Taking into account the results of the pilot survey, it was considered that a face to face approach was more suitable in the present context. Applying sidewalk sampling, the people that passing by, were willing to take part in the study, were interviewed (Bunce *et al.*, 2000).

Since a non-random sampling approach was used, special care was taken to represent an as much as possible varied range of perceptions (Bunce *et al.*, 2000). To do so, respondents of diverse ages, professions and residence, met in five different sampling sites (Figure 3.3) were incorporated. The places were selected in order to include local residents as well as visitors, attempting to incorporate in the sample as much variability as possible. The locations were not selected in a random way, but they were chosen because they offered very diverse contexts, and as a consequence it was assumed that they would offer the possibility of illustrating the opinion of a sample of the population of the south coast of the Outer Moray Firth.

It was considered that, with the limited time at disposal, all the effort should have been applied in the Outer Moray Firth. The Inner Moray Firth was designated as a Special Area of Conservation for the only resident population of bottlenose dolphins in the North Sea in 2005. The Outer Firth, unlike the inner and besides its importance for the marine wildlife, has not a recognised conservation status. It was hypothesised that the awareness and concern expressed by the inhabitants of the area could have been used to assess the degree of support for a possible enlargement of the marine protected area to the whole Moray Firth.

Elgin

This was the location more distant from the coast line, being 5 miles inland on the south coast of the Moray Firth. It is the capital of the Moray region and was the biggest centre used in the survey.

Spey Bay

This site was selected because of the presence of the Whale and Dolphin Conservation Society Wildlife Centre.

Portsoy

The Portsoy the Traditional Boat Festival took place on the 9th and 10th of July 2006. The festival represents a major tourist attraction in the area and this year approximately 20,000 people visited the event during the two days (BBC, 2006). Interviews were carried out during the festival as the popularity of the event enabled a diverse sample of respondents to be interviewed.

Gardenstown

Gardenstown is an old fishing village in Gamrie Bay, on the Moray Firth coast of Aberdeenshire. The local harbour is used by fishing and pleasure boats as well as a whale watching boat. What's more, the Cetacean Research and Rescue Unit (CRRU), a non-profit local research organisation is based in the town.

Crovie

Crovie is a picturesque village in Gamrie Bay. Being a well preserved fishing village, this is one of the tourist attractions of the area. It is the venue of a small art festival every year in July. The interviews were performed during the festival.

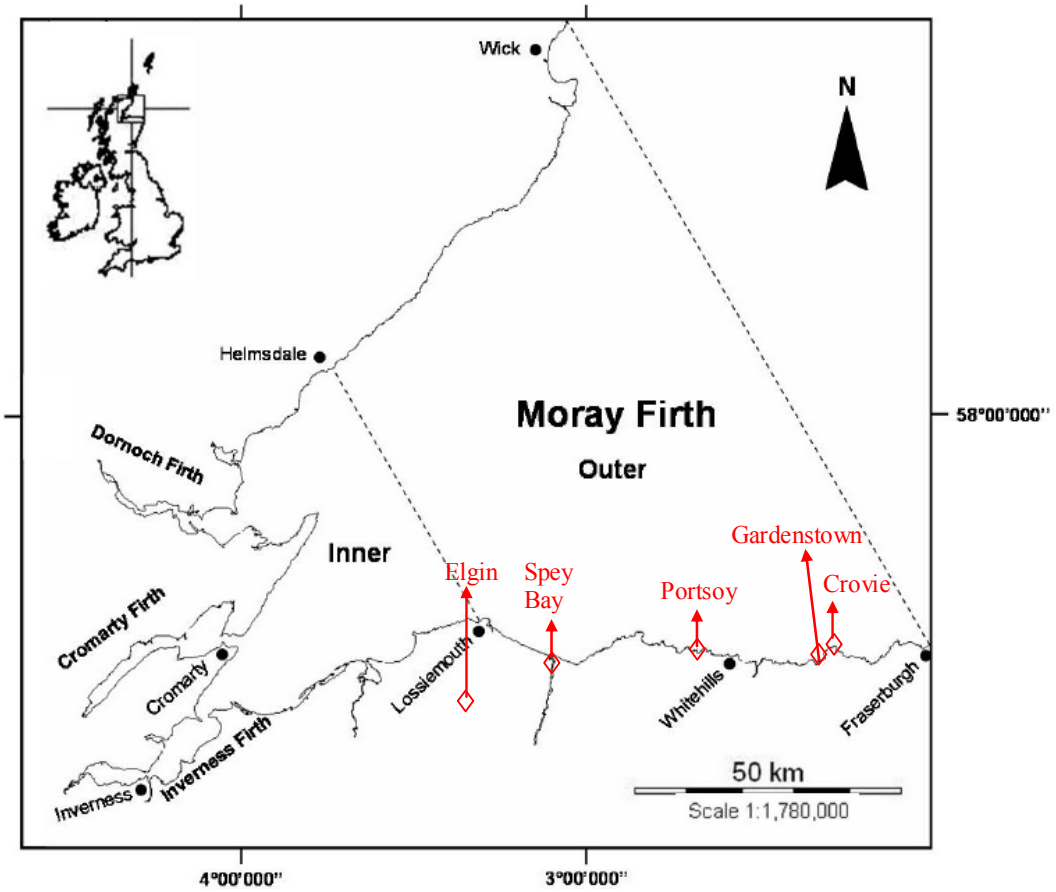

Figure 3.3: Sites sampled for the public survey.

3.3 Data analysis

3.3.1 Stakeholder survey

Semi-structured interviews allowed the investigation of individual experiences, feelings and opinions, what is in general defined qualitative data (Kitchin & Tate, 2000). This choice involved the use of a qualitative analysis for these interviews, emphasizing the interviewees expressed concepts, rather than attempting their quantification (Bryman, 2004).

The first step was the open coding of every interview. Without the establishment of any fixed theme into which categorise the answers of the respondents, the transcripts were read identifying the themes that came out of the data (Esterberg, 2002). In the following stage the relevant coded information was

classified. To facilitate the comparability of the different interviews, a systematic classification was considered more suitable. Whenever possible, the classes were imposed by the researcher (Kitchin & Tate, 2000) taking into account issues clearly investigated by the interviewer and issues suggested by the interviewees.

According to the introduced categories the interviews transcripts were finally coded, in order to merge relationships and associations (Kitchin & Tate, 2000) in the expressed opinions.

3.3.2 Public survey

The information collected in the structured interviews was quantitatively analysed. Closed and open ended question answers were firstly coded. A number was assigned to every answer obtained in each question (Kitchin & Tate, 2000). The codes were then copied in a spreadsheet and analysed using SPSS 13.0 and Excel 2003.

The interviewees were grouped in 6 age classes:

- 1929-1937 (77-69 years old)
- 1938-1946 (68-60 years old)
- 1947-1955 (59-51 years old)
- 1956-1964 (50-42 years old)
- 1965-1973 (41-33 years old)
- 1974-1983 (32-23 years old)

And they were also classified according to their profession. The following categories subgroups were used:

- Technical professions
- Economic and commercial professions
- Fishing sector
- Teaching
- Arts
- Health sector
- Public officer
- Student

- Unemployed
- Retired
- Other

The results were firstly analysed in a descriptive way, considering together the questions that investigated the same concept.

The answers related to public awareness, concern and support for conservation were also recoded in order to investigate possible correlations between these concepts. According to de Vaus (2002), the variables that contributed to a concept were scored in the same direction and then added, in order to generate three indexes, on for each of the investigated concepts.

Because of the size of the sample and being non random, statistical test were not used because considered to be inappropriate.

Plate 3.1: The administration of a structured interview during the Portsoy Traditional Boat Festival.

4 Results

4.1 Stakeholders survey

Preliminary remark: the personal opinions reported in this section belong to people directly involved in local and national organisations, groups and partnerships, who kindly participated in the survey. It was sometimes asked to stress that the opinions that they expressed are personal and do not necessarily represent the body or organisation to which they belong. To respect their privacy, their names are not reported in this dissertation.

12 interviews were carried out, with representatives of the following sectors:

- Conservation
  - Scottish Natural Heritage
  - Scottish Wildlife Trust
  - Moray Coast Countryside Ranger Service
  - Whale and Dolphin Conservation Society
  - Moray Firth Partnership
- Scientific research
  - Aberdeen University
  - Cetacean Research and Rescue Unit
  - SAC Veterinary Science Division
- Fishing
  - Scottish Fishery Protection Agency
  - The consultant that assessed the feasibility of implementing the Moray Firth Fisheries Action Plan
- Whale and dolphin watching
  - Boat operators
  - Dolphin Space Programme

4.1.1 Categorisation and description of the data

Several themes came out from the interviews transcripts. These were related to marine conservation, awareness, management implications, affected economic

sectors, public involvement and future developments. The coded pieces of text are reported in Appendix II and are summarised in different tables in this section.

4.1.1.1 Conservation

The presence of different organisation in the area, as SNH, WDCS, MFP, Aberdeen University, CRRU, Coastguard, and DSP was considered by the interviewees a positive component. The Moray Firth Partnership was in particular seen as beneficial for its promotion of sustainable and integrated management and support, for the facilitation of the communication between stakeholders and for the increase in public awareness. The objectives of the partnership were perceived to be wide by most of the interviewees and even too wide to be effective by one of the respondents.

Conservation				
Evaluation	Adverse impact	Limitations	Animal protection	Communication
Several good organisations in the area	Some claims, dolphins eating salmon, damaging nets	Designation of critical habitats in conflict with human use	Animals are protected by EU legislation	Give fishermen information to help them to make informed decisions
Possible conflict with the ongoing developments	No, fisheries can diversify into tourism	In 10 years no development of protection from whalewatching	The species are not well protected	SWT public conference in early '90s
There's a right balance between conservation and industry	No, but it has to be true conservation	No good enforcement, crime persecution is difficult	Protection is good for some species	
	Could be in the future		All human uses regulated	
	No, they're part of the local history		Very little for the whole range of Scottish species	
	No, but problems with media and public perceptions			
	Coexistence is possible, but it depends on education			
	No, increased support of wildlife protection			
	Seals are perceived to be threat			

Table 4.1: Summary of the themes related to conservation.

The balance between conservation and industry was perceived to be fine from the fishing perspective but the growing development in the area was identified as a possible impact from the conservation bodies' side. In general, no adverse impacts of conservation on the traditional practices of the Moray Firth were indicated, in part for the diversification and decline of the fishing industry, and in part because they were considered a significant component of the local identity. Coexistence was perceived as possible. Nevertheless, a future conflict was not excluded because of the major impact that conservation bodies are going to have on fisheries decisions.

All human uses are regulated and there is targeted protection for some species, but the present protection was considered inadequate by two of the respondents.

Several interviewees mentioned limitations of the Moray Firth SAC, as the fact that it does not encompass the range covered by bottlenose dolphins, it does not protect other species and it did not stop the occurrence of impacts. The benefits associated to this SAC were the promotion of conservation and the support of Operation Fishnet, a campaign created to fight the problem of illegal salmon poaching nets.

MPA			
Good	Intermediate	Bad	Benefits
Because of area recognition If effectively empowered Because will protect more species, not just dolphins Because it'd cover dolphins range Because of proper designation and regulation	The different uses should be considered Respect different interests No-go areas don't work because there are too many interests	Stocks are good if harvested sensibly It'd upset fishermen More benefits by improving management than by closing the area	It'd generate awareness Increase tourism if rigorous control of fishing, otherwise no. It'd easier to restrict activities Holistic fashion conservation

Table 4.2: Summary of the themes related to the establishment of a MPA.

A marine protected area concerning the whole Firth was suggested as a possible solution of the described limits of the SAC. The institution of no-go areas was however criticised because of the different interests that surround the marine environment.

The interviewees expressed different levels of concern regarding the threats faced by whales, dolphins and porpoises. Pollution and consequent dermatitis observed on dolphins were considered a major problem, but at the same time it was discussed that monitoring and control is improving. Noise pollution was looked as the most serious threat since:

> "This animals are perhaps the most acoustically sensitive animals on earth and I believe that the reason for a lot of strandings of the animals are caused by these activities, resulting in acoustic barotraumas in these animals"

Fishing was mentioned in relation to overfishing and illegal salmon nets, where occasionally dolphins are caught. Shipping was named as a stress, both in as commercial boat traffic and whalewatching.

Overall, more scientific research on the possible impacts was considered necessary, as:

> "There is not enough information…the level of any threat it's not very clear"

In addition specific comments on scientific research highlighted the need for further investigations about the marine wildlife, to protect it and to determine how human uses can coexist with it, and finally to use the gathered information to inform developments that will interest the area.

4.1.1.2 Whale and dolphin watching and tourism

Whalewatching was mentioned as a major reason for the development of wildlife tourism in the area. Green tourism was generally perceived to be increasing. The area was perceived to be unknown on the national and local level, despite its environmental richness:

> "This area was missed for many years"

> "In England many people aren't aware of wildlife tourism opportunities here, especially marine wildlife"

Tourism was considered an important part of the economy, with a great potential. The expansion of this sector was also perceived as a compensation for the

decline of the fishing industry. Whalewatching was associated to the visitors demand for sustainable tourism. According to the interviewees, its importance is not only economical, but mainly educational:

"It has the potential to change people attitudes"

According to two respondents, it represents an opportunity for rising people awareness and makes them more concerned by environmental human impact. Nevertheless, it was also considered a concern because of the possible negative impact on the animals.

DSP			
Voluntary	Benefits	Limitations	Development
It works, otherwise the government would enforce it Persecute people is difficult Education is the thing Is a step towards legislation People is involved and so supportive	Is a sensible code It allows negotiation It offers training It offers education It controls behaviour to avoid impacts	It hasn't addressed the general public The training was ineffective There is no marketing Enforcement is through legislation An operator doesn't support it Control is through licensing No guides at the moment It doesn't address speed	Have trained guides on the boats Improve monitoring Introduce licensing

Table 4.3: Summary of the themes related to the Dolphin Space Programme.

The Dolphin Space Programme, a voluntary code of conduct for boat operators involved in wildlife tourism, was considered to be enough to ensure the limitation of impacts on the animals by several respondents. The benefits of this code, according to their answers are that it involves training and education. It appears to be a sensible code that supports communication between the operators. However being voluntary it was also considered a limitation. It does not address the maximum time that can be spent with the animals nor the speed. It was general opinion that it should be a step towards legislation and a licensing scheme. A boat operator suggested that it should address also the general public behaviour.

4.1.1.3 Fishing

Fishing was considered a traditional practice of the Moray Firth that shaped the area:

> "I think the fishing industry is important, a lot of communities around the Moray Firth wouldn't exist"

Respect for fishermen and for their income was demanded by a boat operator, who was a fisherman himself before. The present importance and development of this sector were underlined by both representatives of the fishing sector. Nevertheless the decline of this industry was generally perceived by the respondents.

The traditional knowledge and experience of the local fishermen was valued as an important source of information.

4.1.1.4 Public awareness, involvement and support

Besides registering a low level of public awareness in relation of the marine environment and the natural resources of the area, concern and support were positively expressed:

> "One thing that this place has, very strong, is a very great public concern, especially about the dolphins".

Beach cleaning was seen as a demonstration of public support and as an important educational message. Whales were dolphins are used as icons, to involve people and increase their awareness of the entire local wildlife.

4.1.1.5 Management suggestions

Several stakeholders were in favour of a greater communication and collaboration between the different sectors and organisations. The two representatives of the fishing sector pointed at the importance of balancing conservation and industry, in a sensible, sustainable way:

> "A MPA is not the best solution. A balance of a good marine environment and industries…not simply one or another. There is a perception that

> industry is bad, but is what makes the area viable, is about striking a balance, balance is the k word."

From the conservation perspective, an effective fishing management was considered a requirement in order to preserve the cetaceans' food supply. The designation of particular areas, as the Cromarty Firth and the Sutors as critical habitats for the bottlenose dolphins was considered a further step towards conservation. Taking into account present threats and future developments, the application of the precautionary principle was believed to be necessary.

4.2 Public survey

64 standardised interviews were carried out in five different locations. Each respondent answered a fixed set of 18 questions. The obtained results were divided into two sections:

- Sample description, according to the first 6 questions, the demographic information obtained was used to outline a report on the sample.
- Respondents' answers, the replies to the remaining 12 questions were described and analysed.

Detailed tables and charts that describe that the data are in Appendix III.

4.2.1 Sample description

Special care was used to have an equal representation of both genders, and of the total number of respondents (N=64), 32 were males and 32 females. A minimum age of 18 was considered a prerequisite, and the mean age of the interviewees resulted to be 47.9 years (N=63, SD=12.37), with the youngest respondent being 23 and the oldest 77. The resultant age distribution was reported in Figure 1 of Appendix III. The majority of the respondents, with the 42.2%, resided in the Moray Firth area, followed by the 18.8% from Aberdeenshire, the 9.4% from Aberdeen City, the 17.2% from the rest of Scotland, 9.4% from England, 1.6% from Wales and 1.6% from the rest of Europe (Figure 2). The interviewees that resided in the Moray Firth area have been living in the area for a different amount of time that ranged from one to seventy

years, with a mean time of 26.38 years (N=26, SD=23.58). Finally, for what concerns the respondents' profession, a wide range of occupations was included and a detailed account of them is present in Appendix III.

4.2.2 Respondents' answers

4.2.2.1 Awareness of marine species present in the area

Two questions were designed to investigate respondents' awareness of marine wildlife. In the first the interviewee was asked to quantify how many marine mammals occur in the Moray Firth and in the second to say which species occur.

The most frequent answer to the first query was 6-10 species (31.3% of the respondents), followed by 1-5 (12%). It was observed a general confusion related to the term 'marine mammal': even it was indicated that they should only include dolphin, whale and porpoise species, several respondents included other mammals as well (e.g. great seal, common seal and otter).

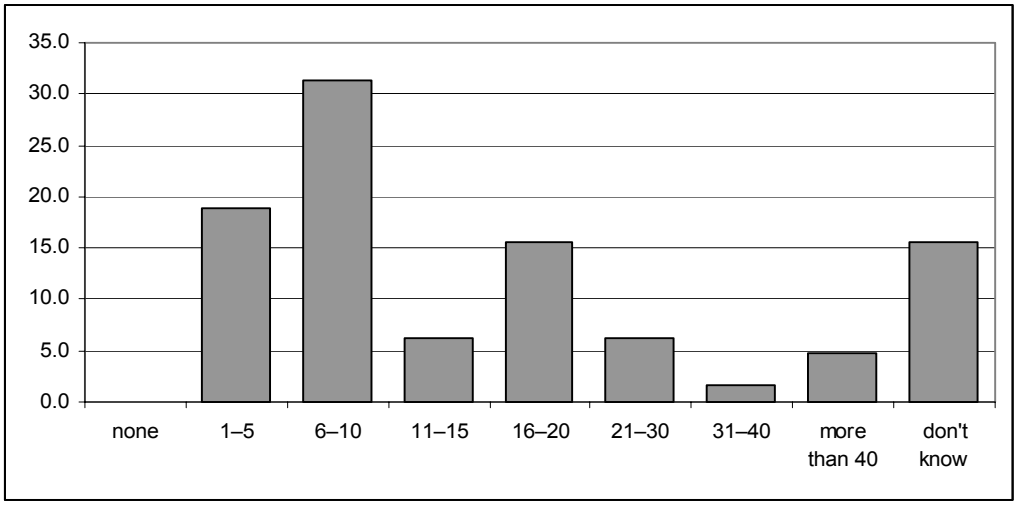

Figure 4.1: Number of cetacean species occurring in the Moray Firth according to the interviewees (N=64).

For what concerns which species occur in the Firth (Figure 4.2), the presence of bottlenose dolphin, harbour porpoise and Minke whale was widely recognised, by respectively the 78%, 75% and 71.9% of the respondents.

A lower percentage of people identified Risso's dolphins (31.3%), Humpback whale (18.8%), killer whale (17.2%) and Grey whale (14.1%) presence. Only 4% of the respondents considered the narwhal part of the local wildlife.

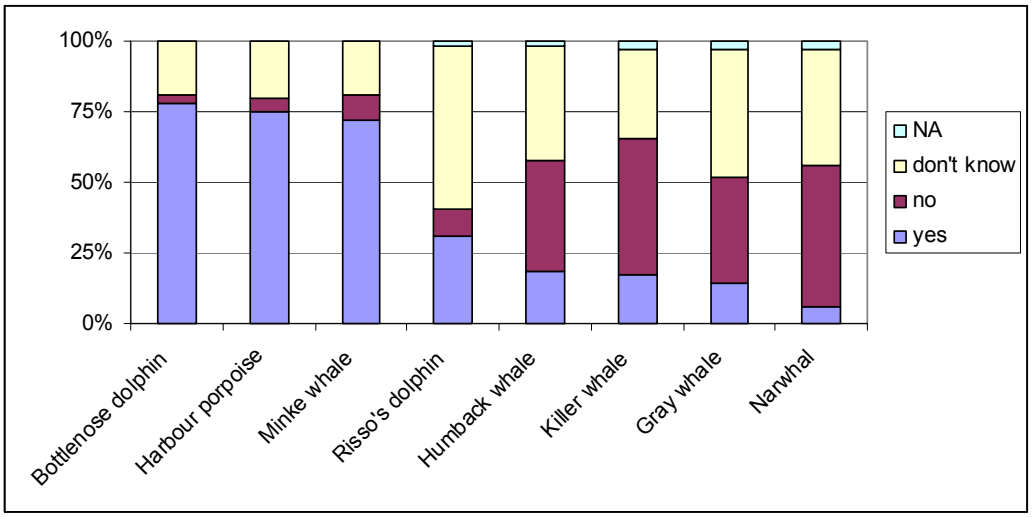

Figure 4.2: Cetacean species presence according to the results obtained in the structured interviews (N=64).

4.2.2.2 Threats perception and concern

The respondents were asked to rate how seriously a set of given factors could threat marine mammals when they were in the Moray Firth. According to their answers (Figure 4.3) the three most serious threats are the entrapment in fishing gear, followed by litter entanglement and oil spills. Conversely, commercial whaling and whalewatching were considered the less dangerous factors.

When they were asked how well cetaceans are protected in Scotland's waters the 45% of the respondents affirmed that they are not sufficiently whereas just the 1.6% considered whales, dolphins and porpoises to be overprotected. Nevertheless, a considerable amount of interviewees (23%) said that they did not know.

Those who were not satisfied by the actual level of protection were asked to suggest possible solutions. For what concerns those who considered cetaceans to be not-sufficiently protected, the more frequent suggestions were the increase protection enforcement and public awareness. The only person that considered the

species to be over-protected stated that these animals do not need protection because they can move away from the threat.

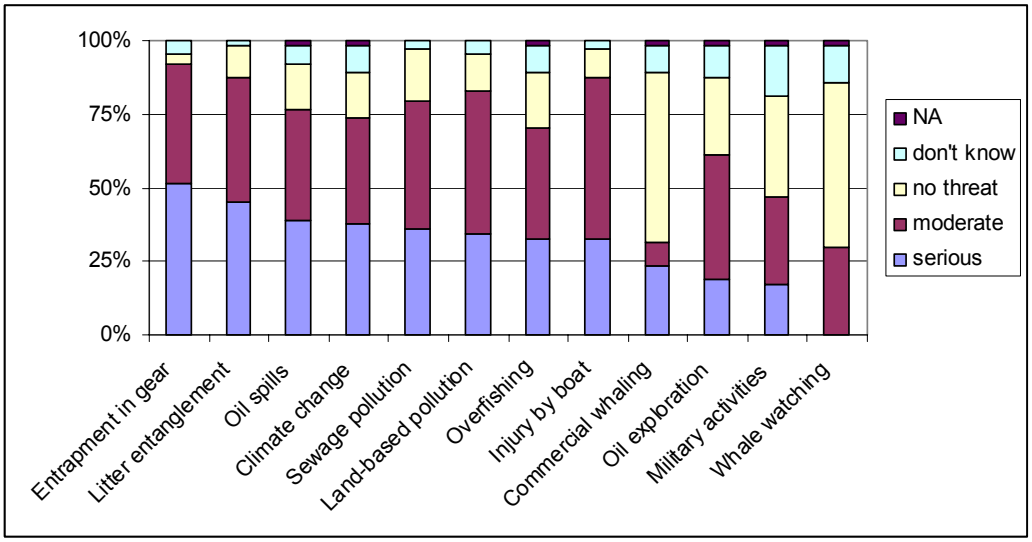

Figure 4.3: Factors that were perceived to threaten marine mammals when they occur in the waters of the Moray Firth.

4.2.2.3 Conservation support

People opinion and support of wildlife conservation was studied at two levels. They were firstly asked how important conservation was for them and then if they were in favour or against a marine protected area concerning the whole Moray Firth.

Answers were generally positive, both for the expressed feelings and support: the 82% asserted that conservation is very important and the 63% judged the hypothetical protected area as a good idea. The majority of those that supported the hypothetic protected area of the Moray Firth explained that it would be a good idea because it could preserve animals and enhance the tourism industry:

> "Preserve cetaceans, to insure their continual survival in the area" (Interview 8, Portsoy).

> "Mammals are in danger, it can prevent stress for dolphins" (Interview 10, Portsoy).

> "The bigger the protected area, more chances to being able to do something for economy and environment" (Interview 13, Portsoy).

The 14% of the respondents considered the marine protected area a bad idea because it could endanger the fishing industry:

> "Fishing is necessary for the fisherman's income and the consumers' needs. But it should be done in an environmentally sustainable way" (Interview 4, Portsoy).

> "There is no need, there are so many activities involved, that with a protected area it would be a nightmare" (Interview 57, Spey Bay).

The 17% of the interviewees opted for an intermediate position, highlighting that even if wildlife conservation is important, other uses of the Firth should be respected:

> "it would be good in terms of conservation which is important but if it would affect local economies e.g. fishing, alternatives/compensation should be provided for the people effected" (Interview 48, Spey Bay).

To investigate the possible variation of support with the gender of the respondents, the results were also used to build a cross table. The resultant tables are reported in Appendix III, and since the percentages are homogeneously distributed across the rows, the variables gender and support should be considered independent.

4.2.2.4 Species and environments protection status

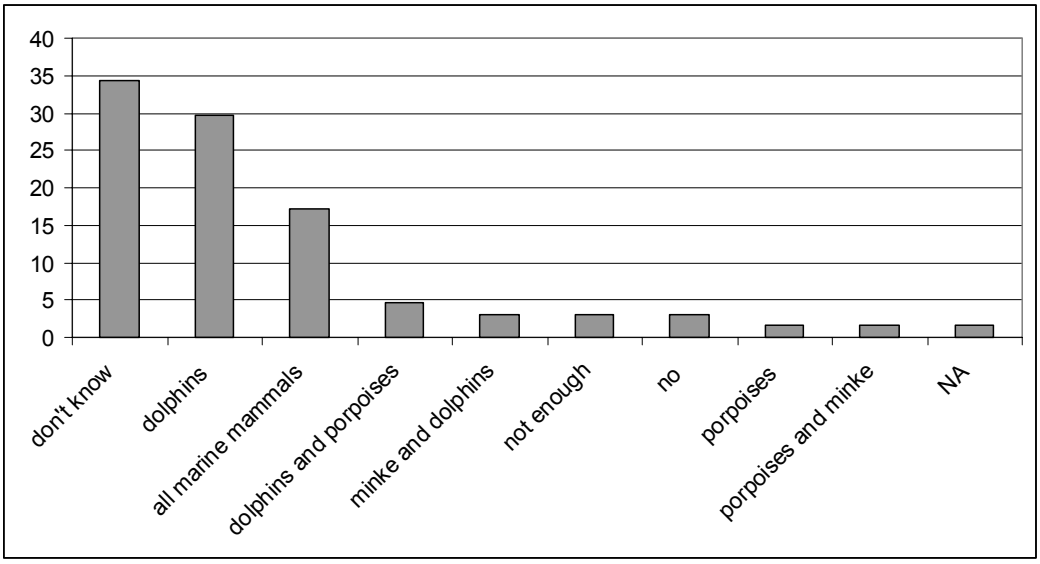

Figure 4.4: Bar chart of the answers to the question about which cetaceans are protected in the Moray Firth.

The interviewees were supposed to say if any of the cetaceans named in the question about cetaceans' presence and absence in the area are protected in the

Moray Firth. The responses were quietly diverse, and included all possible combinations of species (Figure 4.4).

When they were asked to report any marine protected area that they knew in Scotland, the majority (53%) of the respondents answered that they did not know any, approximately the 19% named the Moray Firth (6.3% of which specified that the protected area was in the Inner Firth). Other localities identified were St Abbs and Scapa Flow.

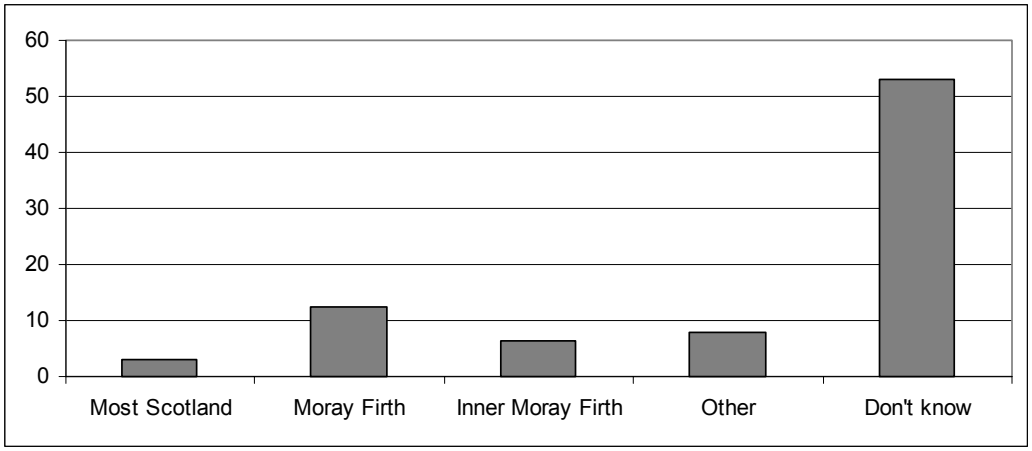

Figure 4.5: Bar chart of the answers to the question on the existence of marine protected areas in Scotland.

4.2.2.5 Economic importance

A set of activities was given to each respondent, and they had to do say how important each activity was for the economy of the Moray Firth. Fishing was considered the most important activity, by the 54.7% of the respondents. Fishing, wildlife tourism and 'other types of tourism' obtained approximately the same rank, when the respective frequencies 'very important' and 'important' were combined, as it can be seen in Figure 4.6.

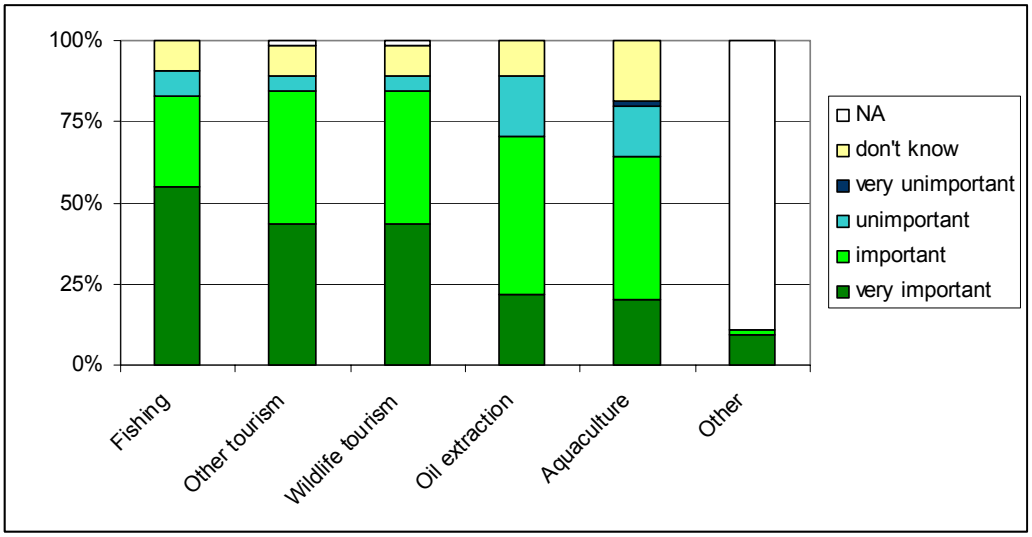

Figure 4.6: Perceived importance of different factors for the economy of the Moray Firth.

4.2.2.6 Perceived conflicts

If the respondents were involved in any of the activities included in the previous section were asked to identify any perceived conflict between their and others activities. Only the of 30% interviewees declared to be occupied in one of the sectors and half of them effectively perceived an impact. The oil industry was considered in conflict with environmental conservation, fishing and tourism, and it was regarded with an evident concern:

"We pollute more than you think" (Interview 41, Elgin)

Fishing was considered to be in conflict with whalewatching and wildlife conservation, but also to represent an impact from the environmental perspective.

4.2.2.7 Relationship between awareness, concern and support

To investigate the possible correlation between the level of awareness, the degree of concern and the support for conservation expressed by each person, indexes were created adding the results of the questions related to each concept:

— Awareness: higher values were given to those who recognised the presence in the area of the three more common cetaceans, bottlenose dolphin, Minke whale and harbour porpoise.

- Concern: higher values were given to those that expressed stronger worry for the threats present in the area and for the protection of the animals.
- Support: higher scores were given to those that considered wildlife conservation very important and to those that were in favour of a marine protected area in the Moray Firth.

The scores assigned in this process are reported in Appendix III.

As it can be seen from the scatter plot matrix in Figure 4.7, there is no clear relationship between the resultant indexes. According to the obtained correlation coefficients, R2 always below 0.09, the relationships can be considered trivial (de Vaus, 2002).

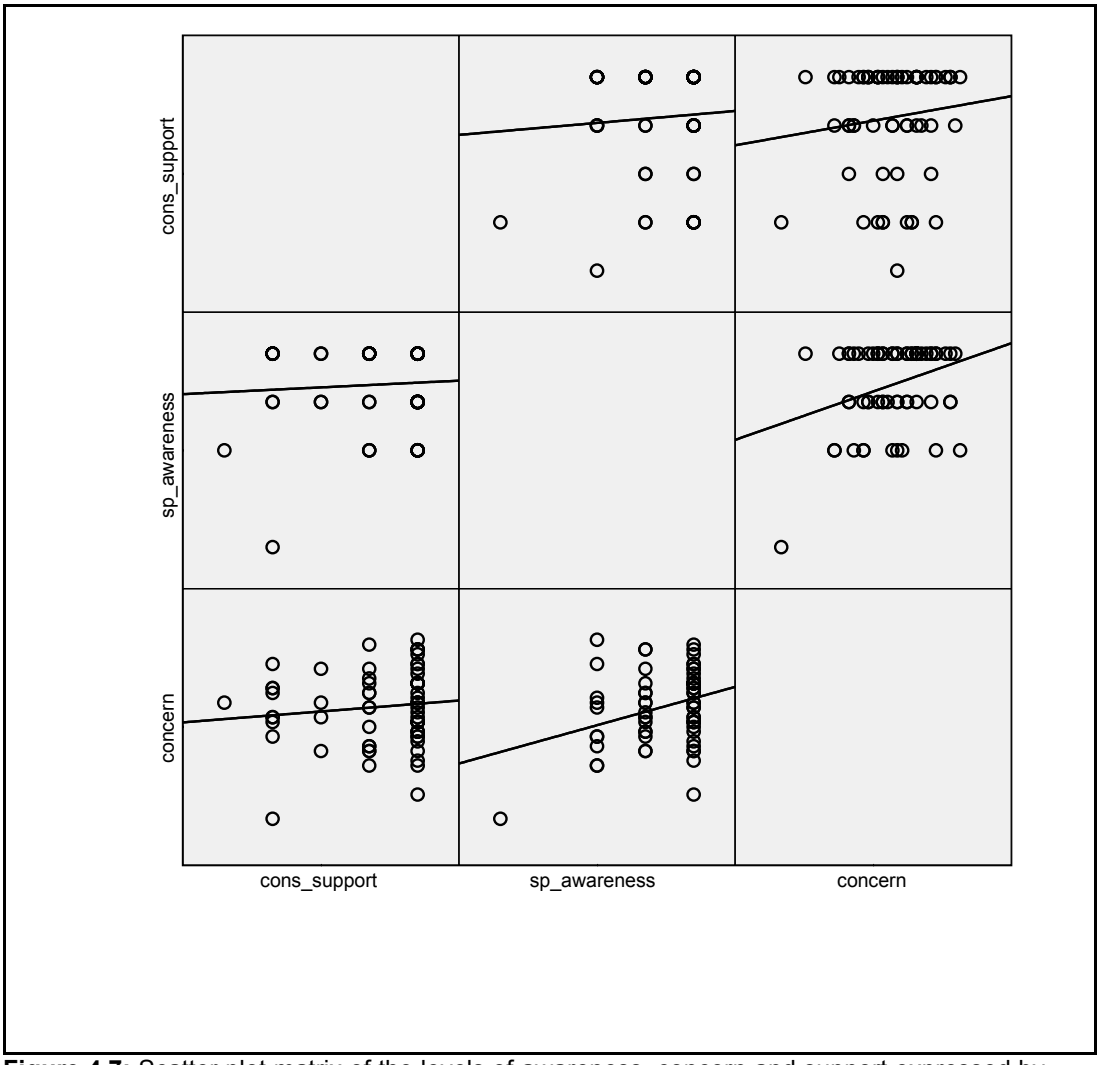

Figure 4.7: Scatter plot matrix of the levels of awareness, concern and support expressed by the respondents of the public survey.

5 Discussion

5.1 Limitations

The main limitation of this study is the sampling methodology used for the public survey. Because of the limited time available and controversial topic, a non probability sample was considered the best approach, and therefore the obtained results should be considered illustrative rather than representative.

No relationships were found between the levels of awareness, concern and support expressed by the public. However, because of the reduced size of the sample and the method used to scale the variables, the obtained result was not considered reliable.

5.2 Awareness and concern

Several activities that take place in the Moray Firth were perceived as a threat for the marine wildlife. From the public survey, the higher degree of concern was associated with those factors that more directly harm the animals: entrapment in fishing gear, litter entanglement and oil spills.

The stakeholder survey underlined more subtle issues, as acoustic barotraumas resulting from oil exploration and military activities, and skin lesions probably generated by water pollution. Entrapment in fishing gear and litter entanglement were also considered, but associated respectively to illegal fishing and to a widespread low recognition of the damage generated by litter. Moreover, concern was expressed for the uncertainty that surrounds the possible effects of these impacts.

More than the 70% of the inhabitants and visitors interviewed knew the three main cetacean species that occur in the area: bottlenose dolphin, Minke whale and harbour porpoise. However, the majority of the respondents was not aware of the

protection status of the species and did not name the Inner Firth SAC as an example of MPA. This partial public unawareness of the local wildlife could also be perceived in the words of the conservation representatives.

A great degree of support for wildlife conservation was expressed by the public. Representatives of different conservation organisations underlined the significant public participation in the frequent beach clean operations organised in the area. The sense of ownership and responsibility towards marine resources, shown by the voluntary involvement in this activity, it's a further demonstration of the local community support.

The management of human behaviour in the marine environment is sometimes deeply associated to the maintenance of healthy marine mammal populations (Wallace, 2003). Taking into account the illustrated degrees of awareness, concern and support, more resources should be focused to channel the present sustain towards the understanding of the lasting, sustainable benefits that conservation can provide (Salm *et al.*, 2000).

The role of marine mammals as indicators of a healthy environment and as charismatic species that can channel public attention and support is generally recognised (Hoyt, 2005). Cetacean species are already used to promote conservation in the area. They were described as "ambassadors for the sea", used to take explain the marine environment and address the actions that in a day to day life can be done to protect the wildlife.

5.3 Comparison between east and west coast

The study was designed in order to be able to compare the results obtained in the public survey with those generated in a previous study carried out in the west coast of Scotland (Scott & Parsons, 2001).

The most similar results were obtained for what concerns the level of protection of cetacean species in Scotland's waters. The Moray Firth sample showed a slightly

higher awareness of the most common marine mammals present in the area. The perceived threats were related, but with a different rank, being the most critical threat oil spills in the west coast and entrapment in fishing gear in the east coast. Lastly, tourism was considered more important in the west coast than in the east, whereas in both sites fishing was still considered the main activity.

5.4 The Moray Firth MPA

Several stakeholders positively evaluated wildlife conservation in the Moray Firth but it was also underlined that the development that is currently interesting the area represents a concern. A specific example was the Whiten Head Marina construction inside the current protected area, the Moray Firth SAC. It was perceived that in ten years, since the area was designated as a candidate SAC, its implementation did not critically improve the protection of the bottlenose dolphin. The interviewed stakeholders and Wilson *et al.* (2004) criticised the SAC for being too small to cover the area actively used by the targeted species, the bottlenose dolphin. Furthermore, being an example of targeted protection, it does not safeguard other species and its enforcement was considered too weak. This latter limitation was perceived also as a possible weakness of hypothetical marine protected area including the whole embayment. The need for specific and enforced legislation was claimed by several stakeholders. There is the need for a more proactive approach in marine conservation, public concern and conservation bodies must be supported by a government action to be successful (Song & M'Gonigle, 2001)

Chanonry Point and the Sutors were identified as critical habitats for the bottlenose dolphins, areas that are essential for the survival and growth of the population (Hoyt, 2005). However, the respondents were concerned about the feasibility of combining no-go areas for wildlife with all the human uses of the firth.

Awareness, concern, support and the perception of the existence of adverse impacts of conservation on the traditional practices are used, as socioeconomic

indicators, to assess the effectiveness of a marine protected area (Gubbay, 2005; Pomeroy et al., 2004). In the present context, wildlife conservation was supported by the public and it was rarely perceived as a limitation. The only expressed issue was related to the impact of seals on fisheries. Generally the impact of the human activities on the environment was stressed more than the impact of conservation on the economy.

5.5 Development and conservation

The expansion of green tourism was stressed by the respondents. Tourism was described as a new economic resource that would compensate the decline of the fishing industry and as a way to promote the area. Whalewatching was considered one of the main activities related to this sector. Even if its educational and economic benefits were clearly stated by those directly involved in whale and dolphin watching, its impact on wildlife was expressed and the implementation of a licensing scheme suggested. Because of the presence of the animals in coastal waters, the most easily accessible and human affected areas, the sustainability of this activity is critical (Woods-Ballard *et al.*, 2003). A positive component of the present whalewatching activities is the reduced number of boat operators in the area, just 11, and their being distributed all along the coast of the firth, mitigating the possible adverse effects. A future expansion of the sector, with an increase of the number of operators should therefore be monitored, and possibly legally regulated. Even if whalewatching is generally considered a form of ecotourism, it should not be considered a panacea that will sustain the economy with a non-exploitative use of the wildlife: conservation organisations must carefully monitor it to guarantee that the development of ecotourism will support rather than defeat the sustainability of the area (Giannecchini, 1993).

In relation to this and the other uses of the marine environment that have the potential of threat species and ecosystems, the importance of the precautionary

principle, proposed by one of the stakeholders, must be stressed. The knowledge of the level and effect of these impacts is still limited, therefore their prevention is difficult. The precautionary principle, aiming to reduce this uncertainty “by requiring prudence, wise management, public information and inclusive participation, and the best technology all over the planet” (O’Riordan, 2000), could be a powerful tool for the integration of economic development and environmental conservation.

6 Conclusion

As was stressed by Pomeroy (2004), since perceptions have an impact on conservation, even if their measurement tends to be imprecise, their investigation can be valuable for the management of a marine protected area.

The knowledge of the cetacean species present in the area and the concern expressed for the threats that these animals face in the waters of the Moray Firth make the mission of seeking support for conservation measures and implanting them, critical but promising.

Since the prevention of impacts in the marine environment can be extremely difficult, owing to the complexity and variability of marine ecosystem dynamics (Jones & Burgess, 2005), the application of the precautionary principle represents a way towards the sustainable integration of human uses and wildlife protection.

A challenge that emerged during the investigation of the feasibility of a Moray Firth MPA from the social perspective was finding a way to effectively integrate economic, cultural and conservation values. A crucial role to achieve this goal can be played by the existing voluntary coalition, the Moray Firth Partnership. Partnerships are a recognised essential component of marine policies (Jones & Burgess, 2005), and the existing MFP could represent a fertile ground for the development of the balance between economy and conservation, which would keep both sides viable.

Taking into account the concern expressed towards those human activities that have the potential to harm the marine wildlife, and the generally perceived limitations of the SAC, effective and enforced legislation is a key step for marine conservation in the Moray Firth.

The establishment of a protected area concerning the whole Moray Firth was supported by the majority of the public but perceived to be in conflict with the present uses of the firth by the stakeholders.

Marine mammals' conservation is a difficult issue that can not be separated from the management of other factors related to the marine environment (Crespo & Hall, 2001). This study should be considered as a preliminary investigation of these social factors. The importance of people understanding and involvement in the establishment and management of MPA has been stressed before (Gubbay, 1995). Further research is needed to determine how to achieve these two critical objectives.

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Appendix I: Structured interview schedule.

1. Marine resources of the Moray Firth

2. Are you: □ male □ female **2.** Year of birth:……..

3. Do you live in the Moray Firth area? □ yes □ no

4. If you answered **yes** to the previous question, how many years have you been living here?.....

5. If you answered **no** to question 3:
   Place of residence.....
   Please state you reason for being here at this time:……

6. What is your present occupation?.....

7. Please rate on the scale below how important wildlife conservation is for you:

Not important	Relatively important	Of consideration	Quite important	Very important	Not sure
□	□	□	□	□	□

8. How many species of marine mammals (whales, dolphins, porpoises, etc.) occur in the waters of the Moray Firth?
   □ None □ 6-10 □ 16-20 □ 31-40 □ Don't know
   □ 1-5 □ 11-15 □ 21-30 □ More than 40

9. Do the following species occur in the Moray Firth?

Risso's dolphin	□ yes	□ no	□ don't know
Killer whale	□ yes	□ no	□ don't know
Bottlenose dolphin	□ yes	□ no	□ don't know
Narwhal	□ yes	□ no	□ don't know
Harbour porpoise	□ yes	□ no	□ don't know
Gray whale	□ yes	□ no	□ don't know
Minke whale	□ yes	□ no	□ don't know
Humpback whale	□ yes	□ no	□ don't know

10. Are any of the above marine mammals protected in the Moray Firth and if so, which ones?.....

11. Which of the following do you perceive to be a threat to the marine mammals when they are in the waters of the Moray Firth?

	Serious threat	Moderate threat	No threat	Don't know
Entrapment in fishing gear	□	□	□	□
Injury by boat	□	□	□	□
Litter entanglement/digestion	□	□	□	□
Sewage pollution	□	□	□	□
Pollution from land-based sources	□	□	□	□
Over-fishing	□	□	□	□
Whale watching	□	□	□	□
Military activities	□	□	□	□
Oil spills	□	□	□	□
Oils exploration	□	□	□	□
Climate change	□	□	□	□
Commercial whaling	□	□	□	□

12. How well do you think whales, dolphins and porpoises are protected in Scotland's waters?

□ over-protected □ sufficiently protected □ not sufficiently protected □ don't know

If you think that the species are **over-protected**, how would you change the management of the area?.....
If you think that the species are **not sufficiently protected**, what should be done?.....……...

13. Do you know any protected areas in Scottish waters and if so, where?
……

14. How important are the following activities to the economy of the Moray Firth?

	Very Important	Important	Unimportant	Very Unimportant	Don't know
Fishing	□	□	□	□	□
Aquaculture	□	□	□	□	□
Oil extraction	□	□	□	□	□
Marine wildlife tourism	□	□	□	□	□
Other types of tourism	□	□	□	□	□
Other:…….	□	□	□	□	□

15. If you are involved in any activity listed in question 14, do you consider it to be in conflict with any other activity? Please identify the activities:

Your activity/s	Conflicting activity/s

18. Do you think that a protected area concerning the whole Moray Firth would be a good or bad idea? Please state your reasons:
……
……

19. Contact information [optional]:……

20. Do you have any further comment?
……
……
……

Thank you very much for your time.

Appendix II: Identified themes.

SR: Scientific Research, three representatives (SR1, SR2, SR3).

W: Whalewatching, two representatives (W1, W2).

C: Wildlife Conservation Organisations, five representatives (C1, C2, C3, C4, C5).

F: Fishing Sector, two representatives (F1, F2).

THEME GROUP	THEME	EXAMPLE	ID
Threats	Pollution	Assess impact of sewage on dolphins and submerged sanW2anks.	C1
	Bombing	Don't observe dolphins close to bombing range, but they're not aware of any impact.	C1
	Pollution	Pollution, lesions on dolphins, research suggested a possible effect.	C2
	Shipping	Commercial boat traffic	SR1
	Pollution	Treatment is developing and water quality improving	C2
	Fishing	Illegal fishing, shipping, potential pollution.	F1
	Shipping Pollution Uncertainty	We don't know all the threats, we know a lot of them, operators bringing people on boats that chase dolphins, pollution (dolphins with skin lesions, dermatitis),	C5
	Shipping Fishing	stress from shipping, stress from drag nets, but people is more conscious now and there is less of that kind of netting	C5
	Fishing	One of the main threats is the nets, especially illegal gillnets. Operation Fishnet,	C3
	Whalewatching	Whalewatching	SR1
	Noise pollution	The biggest threat is noise pollution. 50 miles offshore there's a relentless traffic of boats and oilrigs, there are still nuclear activities and these animals perhaps the most acoustically sensitive in the world. Is the reason for a lot of strandings.	SR2
	Overfishing	Overfishing has continued over the last decades, when we think of protecting whales and dolphins we also need to think of protecting resources	SR2
	Fishing	Very occasionally there's a dolphin caught in illegal salmon nets and I don't know whether legal fishing is a problem for dolphins here anymore	W2
	Developments	Developments. Bigger scale problems like climate change and fish stock declining are a problem for all marine species but I don't know what impact is going to have in this area.	W2
	Shipping	Jet skies and flat boats, too fast	W1
	Uncertainty	Difficult to assess disturbance	SR1
	Natural	Natural threats: bottlenose for porpoises	SR3
	Uncertainty	But the level of any threat is not very clear, not enough information	SR3
	Monitor	There is a vessel monitoring possible disturb of whales with windmill construction	F2
	Noise Activities	Noise pollution or just the increasing activity around the MF. We're going to be more and more in a situation were we've to create a balance (DSP, number of operators)	C3
	Overfishing	Overfishing is a little bit. You've to be careful	C3
	Fishing	Two strandings for fishnet of illegal salmon fishing.	C1
	Fishing	Some by catch (is not much here)	SR1
	Uncertainty	No, but we don't know what is going to happen in the future (different fisheries)	SR3

	Fishing	Entrapments are very occasional, set nets are gone down, fisheries are more aware of accidents	F2
	Fishing	No by catch. Illegal netting, public shouldn't blame fishing industry.	F1
	For fish	Climate change	F2
		Pollution controlled, 1985 Food & Environment Protection Act	F2
SAC for dolphins	Conservation	Promotes conservation around the world	C1
	Limitations	Potential problems further north distribution, no protection	C1
		Doesn't encompass dolphin range	SR1
		The idea of a SAC seems to be insufficient, the outer Firth is not a corridor area but is important for calving	SR2
		There is increasing movement of dolphins in the outer Firth	C5
		Building a SAC around bottlenose dolphins is a difficult concept because this species would explore the most depredated areas	SR2
		Doesn't protect other animals	SR1
		It hasn't stop any of the impacts that are there (oil drilling, boat traffic). There is no amount of legislation that would stop oil companies drilling if oil was found in the inner MF.	SR2
Moray Firth Marine Protected Area	Good idea	Good, because of area recognition	SR3
		Good idea but how we've got them empowered? More legislation we have I think the better, as long as it is enforced properly	C3
		Good, cover dolphins range and be useful not just for the dolphins	C5
		Supported by SWT, proper MPA designation, broad and regulated	C2
		To ensure protection, a legal tool	SR3
		Good in a sense, but impact of development already assessed.	C1
		It would be good if we could stop some of the developments or have them done in a more sensitive way	W2
	intermediate	I'm not sure MPAs are actually the answer. Is difficult to draw boxes around animals that are moving. The SAC hasn't really changed things. No-go areas don't work because there are too many different stakeholders and interests that can't be excluded. All commercial shipping comes into the Cromarty Firth and the Sutors are a critical area.	SR2
		Zoning would be probably sensible but other people use of the area are important and we need to consider all different stakeholders and local communities.	W2
		MFP has a neutral position, beneficial because of sustainable use but respect all different interests	C2
	Bad idea	I'm against. Sustainable management not closing industries. I'm sceptical that the benefits would be higher than improving managing practices to reduce impacts.	F1
		Scottish Executive are reluctant about marine protected areas, fishermen would be upset	SR3
		Bad. Stocks are good if harvested sensibly. I don't think it should be closed to shipping and fishing	W1
		No. Example of Sternway and dead scallops	F2
	Benefits	More awareness, more tourism	C1
		In an official area is easier to restrict activities	SR3
		It would put the Moray Firth on the map, and people will know is there and visit it.	C5
		Depends on regulations, if rigorous control of fishing, otherwise no.	SR1
	Objectives	Comprehensive, holistic fashion, not just focus on a top-down species, system overall	C2

Tourism	Missed area	This area was missed for many years	W1
	Important	Huge part of the economy (golfing, walking)	C1
	Wildlife tourism increase	Visit Scotland, the Scottish tourist board are putting an awful lot more of their resources into encouraging wildlife tourism	C3
	Wildlife tourism increase	Wildlife tourism is increasing, amazing lots of people come in the winter. Markets are expanding into green tourism.	C5
	Impact	Potential is moving with cruise lines that have a potential effect on marine environment	C2
	Compensation fishing industry	I think is very important here, especially with the decline of the fishing industry, a lot of emigrations out of the area	W2
	Missed area	In England many people aren't aware of wildlife tourism opportunities here, specially marine wildlife	W2
	whalewatching	Whale and dolphin watching is of medium importance, there's more we could do to develop that side	W2
	Wildlife tourism increase	Visit Scotland are very keen on developing wildlife tourism. They're becoming aware that tourists want sustainable tourism	W2
Communication	General public	SWT public conference on MF in early '90s	C2
		Public interaction important aspect of MFP, free membership, 600 members, is doing incredibly well	C2
	Specific	Give them (local fishermen) as much information as possible to help them make informed decisions	C3
Education	Schools	Children programs. Local children are more aware compared to Inverness	C1
		To realize that they've got something special here on their door step	C3
		We go to the local school annually and do a beach clean with them	SR2
	General public	Guiding on boats, there's lot of education (…) not just a nice fun trip but actually (people) might try and have a positive on the ecosystem and animals. Hopefully do something that can have some positive effect.	C3
Public involvement	Beach cleaning	Local community had seen that, they were a bit angry that it looked so dirty and we had about 60 people turn up for that first beach clean this year	C3
		We hope there is another educational message that comes out of the very action of looking at litter on the beach and picking it up	C3
		Regardless the weather, there's always a good bunch of people, once a month. So I think is a nice positive action.	C3
	Cetaceans	We use dolphins a sort of icon species, as a hook, and then explain the rich local natural heritage. The fact that we can use a picture of a dolphin to get people to do a beach clean is an example of real positive action	C3
		Using whales and dolphins are ambassadors for the sea, they're good to get people attention and then hitting them with some of the basic issues and how they can address them on a daily basis, like friendly washing liquids. And that's an effective action in terms of waste disposal.	SR2
DSP	Satisfaction	Enough. Requires continuous monitoring. Works well here.	C1
		Problems with operators that didn't want to sign but is seems to be working fairly well	C2
	Voluntary/ compulsory	An approach that works otherwise the government would enforce it	C1
		Persecute people is very difficult	W1
		Education is the thing, it can take a while	W1
		Voluntary is better than nothing. You've to do something	W2

		and if you can't have legislation then you need something else. But voluntary code are a step towards getting legislation.	
		I think it's much better as a voluntary code, people who are in it buy into it, they learn about it themselves. Legislation needs to be there but it would be better first be starting with a voluntary code and have people doing it because they want to	C3
	Benefits	Is common sense, is a sensible code, we can work with it easily	W1
		We always negotiate very fairly with the operators. We're very much seen as a collaboration. We help with communication and facilitation.	W2
		Legislation wouldn't offer training opportunities and educational materials, so it has more benefits than just legislation.	W2
		What we're trying to do at the moment is managing boat behaviour, so that impacts are less likely to happen	W2
	Limitations	Hasn't addressed the general public, is only nine boat operators and thousands of other people need to be educated	W1
		Training was a waste of time, let's do it properly (fishermen for a long time before)	W1
		There is no marketing (how long they're going to get before they do it?)	W1
		It would be so easier if the Scottish executive or some kind of European designation said 'no stopping there' (about critical areas)	W2
		There are some benefits but I still need legislation to back it up.	W2
		(about an operator) he signed up but we can't watch him all the time, and we know he doesn't really like the programme, he doesn't really support our aims and he doesn't believe tour boats impact dolphins	W2
		I think there needs to be some kind of licensing scheme. That's what everyone wants, the operators want it, the steering group seems to want it but the government doesn't seem to support it at the moment	W2
		A lot of boats here don't offer the opportunity for that kind of deep experience because they don't have a guide or they don't have the right kind of educational material	W2
		If you issue licences you can regulate them, surely that's the way. Operators should pay for the licence	SR2
		I think in the long run there needs to be legislation in terms of licensing to be truly sustainable, because we need more tourist to come here (…), it needs to be done very carefully and then needs to be some kind of limit of the number of trips	W2
		Doesn't address speed	W1
	Development	In the future have a trained guide on every boat. I'm working with WDCS to develop naturalist training and hopefully we can pilot the scheme here.	W2
		I think I'll be licensed	C5
		I would like to find a ways to monitor DSP better	W2
Conservation	Limitations	Designation of critical habitats (Chanonry Point and Sutors) would mean that no one is allowed to stop and watch the animals there. (…) people have to get though them, people have to get to Cromarty and to Inverness.	W2
		There isn't a really good enforcement, if a fishermen catches a dolphin is a crime but is difficult to persecute	SR3
		In 10 years working here there has been no development in legislation or protection of dolphins from whalewatching boats	SR2
	Animals	Animals are protected by EU legislation. SNH officers	C1

	protection	will investigate any problem and take it to court, but there's no need, it works well.	
		Good protection for some species like cetaceans but very little for the whole range of Scottish species	SR3
		All human uses are regulated	SR3
		The species are not protected well here	SR2
	Evaluation	I think there's a number of extremely good organisations along the coast: MFP, SNH, DSP, boat operators, Aberdeen University	C3
		There is a lot of organisations working to achieve it, SNH is doing a great job (…). The new marine wildlife code is going to be fantastic. MFP, Coastguards and Aberdeen University are doing a lot.	W2
		The work of the MFP is very valuable, and with CRRU and WDCS there is more awareness of the importance of wildlife	C5
		I think conservation here is good but I also feel we are in a quite difficult time, because there quite a lot of development going on and there's a number of different interests that need to be satisfied: Whiten Head Marina example.	C3
		Is fine as it is. The balance between conservation and industry is right.	F1
	Adverse impact on traditional practices	Not here. Some claims from fishermen, dolphins eat salmon and damage nets.	C1
		No, fisheries can diversify into whalewatching, tourism.	SR1
		Not now, it could be: keep balance, be sensible	W1
		No. but it has to be true conservation, if the ward is used for other reasons it can have adverse effect	W1
		No. but the general public must be fully informed. Problems with perceptions of media and papers	F2
		No because the traditional practices are almost dead. Commercial fishing is still here but is a dying industry.	SR2
		There's no reason why all these things can't operate in harmony, it's about education once again	SR2
		No. The WDCS centre was a salmon station, so we have a responsibility as far as I'm concerned to talk about the traditional methods here, tell about how they've been used, sometimes very carefully, sometimes in a good sustainable way, and other times when we've not done things quite so carefully and we're trying as hard as we can to have a positive action from that, so I don't think that, I think the two things should go together.	C3
		A part from seals perceived to be a threat, public is supportive.	C2
		People is increasingly realizing that there's a benefit in protecting wildlife	C5
		Not at the moment. But in the future conservation bodies will have the opportunity to have an impact on fisheries decisions, so it may happen.	F1
		Less than it was. We all want the same thing, we all want healthy populations of salmons, that's good for everybody, fishermen, predators, prey, ecosystem.	C3
Operation Fishnet	Public involvement	Get people to look out for these nets and report illegal nets	C3
	Importance	Salmon fishnets result in higher fatalities, the development of O.F. has been the best action from the protected area (the SAC)	SR2
Marine mammals impact on fishing	Cetaceans	I don't believe fishermen have any grievance against cetaceans	F2
		No direct impact, because majority of cetaceans are in	F1

		the inner Firth, and fisheries there are not of the type that would be impacted	
		Concern about squid fisheries and cetaceans (for the feeding)	F2
	Seals	SAC for salmons and SAC for seals in the MF, potential impact on each other	F1
		There's a misconception about salmon, study in the Cromarty Firth, doing seals autopsies, in a large proportion of cases they had squid, not salmon, in their guts	C5
		Seals are a threat, worms in cod	F2
Moray Firth Partnership	Importance/ benefits	Ensure stakeholder communication	SR1
		People know nothing is done to harm the environment	SR1
		It requires sustainable management of marine resources. Management that protects wildlife and sustains environment.	C2
		Brings sides together, sustainable integration.	C2
		MFP has an impact on increased public awareness, difficult to demonstrate	C2
		WDCS works with MFP on the beach guardian project (litter)	C3
		We're a member, and they support us, they recently gave us a grant for £700 for educational materials and they work very closely with SNH	W2
		Constructive approach bringing people together, different interest groups (conservationists, fishermen), move the debate forward	F1
		It is engaged by the public, try to involve them	F1
	Limitations	No, is too wide ranging, should concentrate on 2-3 things and sort them, and then going to something else	W1
Public	Awareness	They don't associate animals with what happens in the water	C2
		Damage by pollution and plastic bags need to be more widely understood	C5
		People (locals too) don't appreciate what the Moray Firth is (in terms of natural resources)	C5
	Support	One thing that this place has, very strong, is a very great public concern, especially about the dolphins: -because they bring money in the tourist industry -people have a great respect of them and care for them	C3
		So my experience working with the local people has only being positive	C3
		And they love the dolphins you know, most of the fishermen I've spoken to	C3
Management suggestions		The most important issue for cetaceans is food supply: need an effective fishing management	SR1
		Working together is the main thing, operators should work together more	W1
		In the inner Firth there are two areas in particular which should maybe be designated as critical habitat, Hoyt agreed, around Chanonry Point and the Sutors. They're important feeding areas.	W2
		We need to raise the game, we need to be looking at the rest of the world, looking at best practice, what can we do to match that best practice, because we are small and we're local and we're kind of a bit stuck in our ways in Scotland, (about whalewatching)	W2
		Conservation and fishing should be working together	F2
		Common sense, every thing must be balanced, understand each other, no banning, partnership of working. Public opinion goes much against.	F2
		MPA is not the best solution, balance is the k word. A balance of good marine environment and industries, not simply one or another. There is the perception that industry is bad, but is what makes the area viable.	F1
		We (WDCS and other local organisations) would like to	C3

		communicate more with each other	
		I think we won't change our ways until we actually see a negative impact. We really need to be using the precautionary principle	C3
		There's need to be a lot more care taking and I think SNH do a brilliant job making decisions (about development) but we need to get information form research so we can inform this decision as much as possible.	C3
		The best way is to look at industries operating in a sustainable way with minimum impact.	F1
Scientific research		No rate difference between inner and outer Moray Firth	SR3
	strandings	Harbour porpoise most common sp., starvation, food availability	SR1
		Putting money towards research, which right now we (WDCS) think is incredibly important to help people making decisions on development	C3
		We concentrate on bottlenose, Minke and porpoise because these three coastal species are in areas where the highest human impact and degradation of the marine environment occur, coastal waters, and is perhaps the area were we can make most changes.	SR2
		Cetaceans impact on fisheries and vice versa . We need to understand more how to coexist with them	SR2
		We know very little about cetaceans, 86 species, I don't know how much we know about half of them. We need to learn more about these animals simply to protect them, is a completely different directive compared to 50 years ago.	SR2
		Investigate other species as Minke whale	SR1
		Bottlenose-pretty good idea of range, feeding, health	SR1
Traditional practices	Balance right	Fishermen got to be respects, make their own living	W1
	Fishing industry importance	Is important. A lot of communities around MF wouldn't exist. Is still important: local inshore and national offshore.	F1
		Fishing industry is in decline	C5
	Changed times	the coast WAS based on fishing	W1
		There's not so much other boat traffic (a part from whalewatching) around at the moment because the fishing industry declined so much	W2
		Now there are at least 50% less vessels compared to 10 years ago. Fisheries moved on, big vessels, fish further away, fish inshore is unsustainable with the costs of vessels and fuel.	F2
	Aquaculture importance	Just a little amount of shell farming, less imp than in the west coast	F1
	Fishing sustainability	Yes when managed in the right way	F1
	Traditional knowledge	The other thing is very important for us to show is respect for the knowledge that the fishermen here have, and our papers and scientific knowledge it's worth an awful lot but so is the knowledge that has been passed down through generations of fishermen. Because these people have worked on the sea for many years and their information is very valuable	C3
		Fishermen are a very healthy source of information for us and a lot are extremely interested in whales and dolphins.	SR2
Whale watching	Suggestions/ Development	You get different groups of people on the boats, and they need different ways of interpreting what they're seeing and what they're interested in	C3
		Use puppets, film, laminated sheets	C3
		It has to be done incredibly carefully, it has the potential to have a lot of negative impacts	W2
		We're quite lucky in this area because the operators are very spread out, only 11 in the whole Firth	W2

		Set a dolphin police, to work with the fisheries protection officer and Operation Fishnet etc., and be on the water like Kenyan Wildlife Services.	SR2
		Restrict the encounter time, system used in Ireland, it could work here	SR2
		We need to do research and that's something I've been asking for a long time but is really hard to show impacts of disturbance from boat traffic on cetaceans	W2
		I'd be keen, most of all, to be putting our efforts now in to encouraging land based watching (Chanonry Point)	C3
		Development of land based sites to see cetaceans	C2
	Importance	People are interested in this area for that reason	W1
		Is important for us	W1
		There's not a huge amount of employment because they're only 11 operators and only have 1-2 staff.	W2
		The real benefit is the emotional and educational benefit, it has the potential to change people attitudes. But it has to be structured interpretation. Mark Orams, interpretation is an exciting new part to whalewatching.	W2
		Opportunities for education and conservation and rising awareness. Make people more caring about the world, more aware of global warming, fisheries problems, pollution	W2
	Negatives	Tourist boats are a great concern, no good for the whales	SR1
		Negative impact on dolphins (changes in surfacing patterns). But at the moment we don't know whether they're an impact, is not as likely here as in other places (not many boats). At the moment we don't know that it has an impact.	W2
Identity		We've got a wildlife resource (address speed)	W1
		We've this incredible wild area and that's why we get tourists coming here.	C3
Overall perceptions		Competitiveness of fishing, cetaceans, sharks…is always going to be there	F2

Appendix III: Graphs and tables.

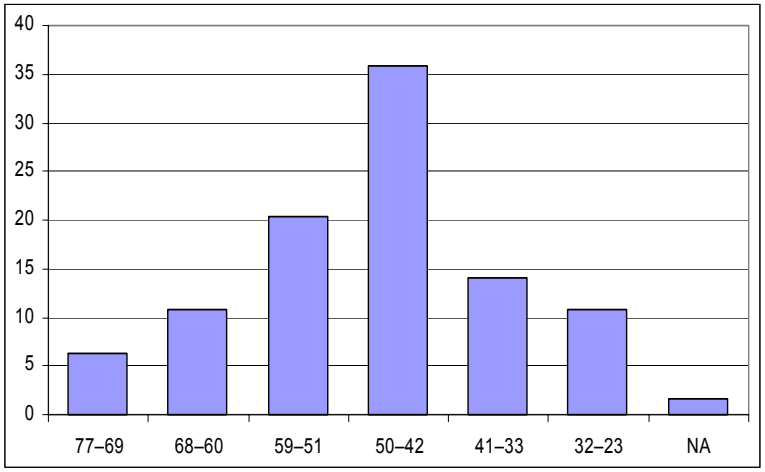

Figure 1: Percent of respondents to the public survey in each age class (N=64).

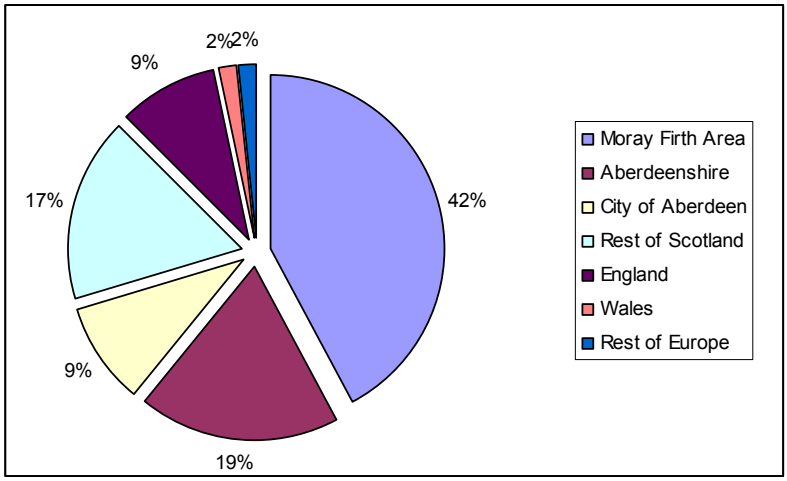

Figure 2: Residence of the respondents (N=64).

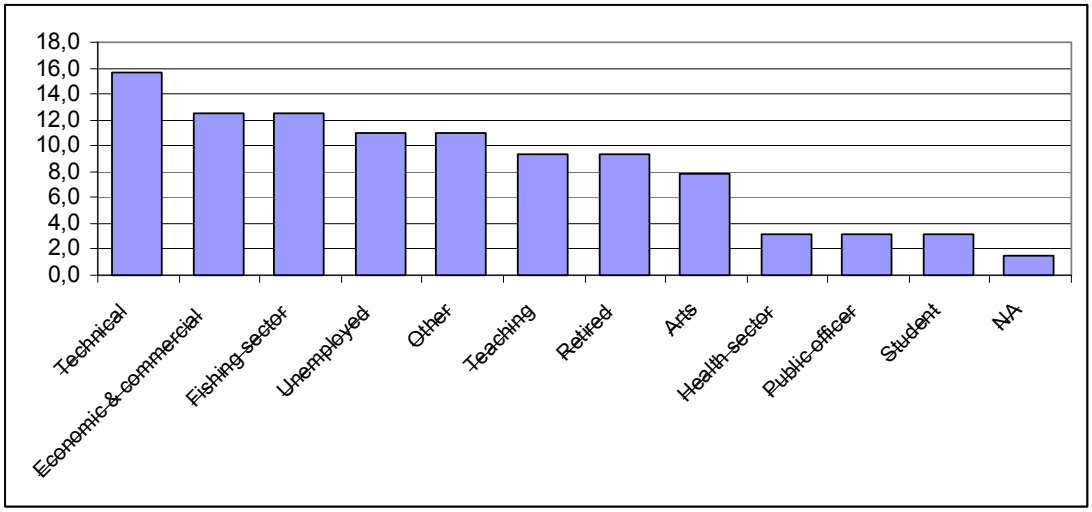

Figure 3: Professions of the respondents (N=64).

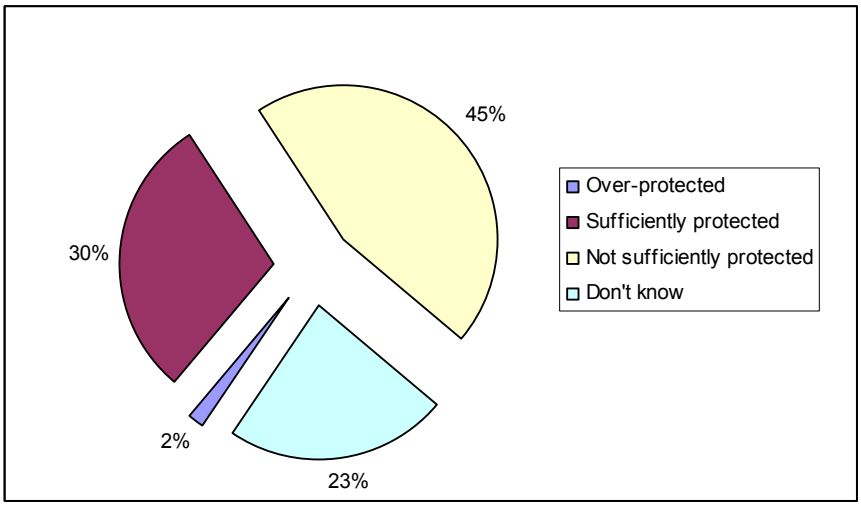

Figure 4: Perceived level of protection of cetaceans in Scotland's waters (N=64).

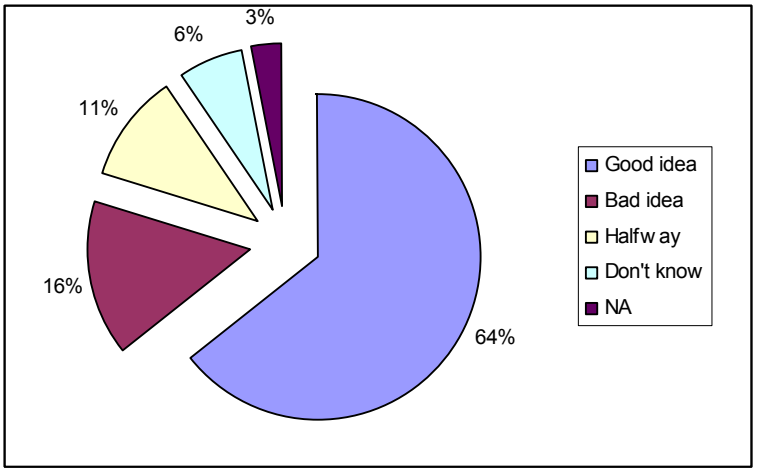

Figure 5: Evaluation of the hypothetic marine protected area concerning the whole Moray Firth (N=64).

cons_imp * gender Crosstabulation

			gender		
			male	female	Total
cons_imp	not important	Count	0	1	1
		% within gender	.0%	3.1%	1.6%
	relatively important	Count	1	0	1
		% within gender	3.1%	.0%	1.6%
	quite important	Count	4	5	9
		% within gender	12.5%	15.6%	14.1%
	very important	Count	27	26	53
		% within gender	84.4%	81.3%	82.8%
Total		Count	32	32	64
		% within gender	100.0%	100.0%	100.0%

Table 1: Cross table of the variation of wildlife conservation importance with gender.

MF_PA * gender Crosstabulation

			gender		
			male	female	Total
MF_PA	medium	Count	5	6	11
		% within gender	15.6%	18.8%	17.2%
	bad	Count	4	5	9
		% within gender	12.5%	15.6%	14.1%
	good	Count	20	20	40
		% within gender	62.5%	62.5%	62.5%
	don't know	Count	3	1	4
		% within gender	9.4%	3.1%	6.3%
Total		Count	32	32	64
		% within gender	100.0%	100.0%	100.0%

Table 2: Cross table of the variation of the support for the hypothetic Moray Firth MPA with gender.

conservation importance	value	species presence	value	perceived threat	value	Scotland's protection	value	MF MPA	value
not important	-1	yes	1	serious	2	over-prot.	-2	good	2
relatively important	1	no	-1	moderate	1	sufficiently prot.	-1	medium	1
of consideration	2	don't know	0	no threat	-1	not sufficiently	1	bad	-1
quite important	3			don't know	0	don't know	0	don't know	0
very important	4								
not sure	0								

Table 3: Evaluation of the hypothetic marine protected area concerning the whole Moray Firth (N=64).

Appendix IV: Used abbreviations.

CRRU, Cetacean Research & Rescue Unit.

DSP, Dolphin Space Programme.

IUCN, International Union for Conservation of Nature and Natural Resources.

IWC, International Whaling Commission.

MF, Moray Firth.

MFP, Moray Firth Partnership.

MPA, Marine Protected Area.

SAC, Special Area of Conservation.

SNH, Scottish Natural Heritage.

SWT, Scottish Wildlife Trust.

WDCS, Whale & Dolphin Conservation Society.